

Appendix A

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ActiveX Scripting

Interfaces and Methods

IActiveScript

The scripting engine must implement the **IActiveScript** interface in order to be an ActiveX Scripting engine.

Methods in Vtable Order

IUnknown methods Description

QueryInterface Returns pointers to supported interfaces.

AddRef Increments the reference count.

Release Decrements the reference count.

IActiveScript methods Description

SetScriptSite Informs the scripting engine of the **IActiveScriptSite** site provided by the host.

GetScriptSite Retrieves the site object associated with the ActiveX Scripting engine.

SetScriptState Puts the scripting engine into the given state.

GetScriptState Retrieves the current state of the scripting engine.

Close Causes the scripting engine to abandon any currently loaded script, lose its state, and release any interface pointers it has to other objects, thus entering a closed state.

AddNamedItem Adds the name of a root-level item to the scripting engine's name space.

AddTypeLib Adds a type library to the name space for the script.

GetScriptDispatch Retrieves the **IDispatch** interface for the methods and properties associated with the running script itself.

GetCurrentScriptThreadID Retrieves a scripting-engine-defined identifier for the currently executing thread.

GetScriptThreadID Retrieves a scripting-engine-defined identifier for the thread associated with the given Microsoft Win32® thread.

GetScriptThreadState Retrieves the current state of a script thread.

InterruptScriptThread Interrupts the execution of a running script thread.

Clone Clones the current scripting engine (minus any current execution state), returning a loaded, unsited scripting engine in the current thread.

IActiveScript::AddNamedItem

```
HRESULT AddNamedItem(
    LPCOLESTR pstrName,    // address of item name
    DWORD dwFlags          // item flags
);
```

Adds the name of a root-level item to the scripting engine's name space. A root-level item is an object with properties and methods, an event source, or both.

pstrName

[in] Address of a buffer that contains the name of the item as viewed from the script.
The name must be unique and persistable.

dwFlags

[in] Flags associated with item. Can be a combination of these values:

Value**Meaning****SCRIPTITEM_ISPERSISTENT**

Indicates that the item should be saved if the scripting engine is saved. Similarly, setting this flag indicates that a transition back to the initialized state should retain the item's name and type information (the scripting engine must, however, release all pointers to interfaces on the actual object).

SCRIPTITEM_ISSOURCE

Indicates that the item sources events that the script can sink. Children (properties of the object that are in themselves objects) can also source events to the script. This is not recursive, but it provides a convenient mechanism for the common case, for example, of adding a container and all of its member controls.

SCRIPTITEM_ISVISIBLE

Indicates that the item's name is available in the name space of the script, allowing access to the properties, methods, and events of the item. Because by convention the properties of the item include the item's children, all child object properties and methods (and their children, recursively) will be accessible.

SCRIPTITEM_GLOBALMEMBERS

Indicates that the item is a collection of global properties and methods associated with the script. Normally, a scripting engine would ignore the object name (other than for the purpose of using it as a cookie for `IActiveScriptSite::GetItemInfo`, or for resolving explicit scoping) and expose its members as global variables and methods. This allows the host to extend the library (run-time functions and so on) available to the script. It is left to the scripting engine to deal with name conflicts (for example, when two **SCRIPTITEM_GLOBALMEMBERS** items have methods of the same name), although an error should not be returned because of this situation.

SCRIPTITEM_NOCODE

Indicates that the item is simply a name being added to the script's name space, and should not be treated as an item for which code should be associated. For example, without this flag being set, VBScript will create a separate module for the named item, and C++ might create a separate wrapper class for the named item.

SCRIPTITEM_CODEONLY

Indicates that the named item represents a code-only object, and that the host has no `IUnknown` to be associated with this code-only object. The host only has a name for this object. In object-oriented languages such as C++, this flag would create a class. Not all languages support this flag.

Returns**S_OK**

The named item was successfully added to the script's name space.

E_UNEXPECTED

The call was not expected (for example, the scripting engine has not yet

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been loaded or initialized).
E_POINTER An invalid pointer was specified.
E_INVALIDARG An argument was invalid.

See also [IActiveScriptSite::GetItemInfo](#)

IActiveScript::AddTypeLib

```
HRESULT AddTypeLib(
    REFGUID guidTypeLib, // LIBID of type library
    DWORD dwMaj,         // major version number
    DWORD dwMin,         // minor version number
    DWORD dwFlags        // option flags
);
```

Adds a type library to the name space for the script. This is similar to the **#include** directive in C/C++. It allows a set of predefined items such as class definitions, typedefs, and named constants to be added to the run-time environment available to the script.

guidTypeLib

[in] LIBID of the type library to add.

dwMaj

[in] Major version number.

dwMin

[in] Minor version number.

dwFlags

[in] Option flags. Can be **SCRIPTTYPELIB_ISCONTROL**, which indicates that the type library describes an ActiveX control used by the host.

Returns

S_OK

The specified type library was successfully added.

E_UNEXPECTED

The call was not expected (for example, the scripting engine has not yet been loaded or initialized).

TYPE_E_CANTLOADLIBRARY

The specified type library could not be loaded.

E_INVALIDARG

An argument was invalid.

IActiveScript::Clone

```
HRESULT Clone(
    IActiveScript **ppscript // receives pointer to IActiveScript
);
```

Clones the current scripting engine (minus any current execution state), returning a loaded, unsited scripting engine in the current thread. The state of this new scripting engine should be identical to the state the original scripting engine would be in if it were transitioned back to the initialized state.

ppscript

[out] Address of a variable that receives a pointer to the IActiveScript interface of the unsited, cloned scripting engine. The host must create a site and call SetScriptSite on the new scripting engine before it will be in the initialized state and, therefore, usable.

The **Clone** method is an optimization of **IPersist*::Save**, **CoCreateInstance**, and **IPersist*::Load**, so the state of the new scripting engine should be the same as if the state of the original scripting engine were saved and loaded into a new scripting engine. Named items are duplicated in the cloned scripting engine, but specific object pointers for each item are forgotten and are obtained with GetItemInfo. This allows an identical object model with per-thread entry points (an apartment model) to be used.

This method is used for multithreaded server hosts that can run multiple instances of the same script. The scripting engine may return `E_NOTIMPL`, in which case the host can achieve the same result by duplicating the persistent state and creating a new instance of the scripting engine with `IPersist*`.

This method can be called from non-base threads without resulting in a non-base callout to host objects or to `IActiveScriptSite`.

Returns

`S_OK` The scripting engine was successfully cloned.
`E_NOTIMPL` The `Clone` method is not supported.
`E_POINTER` An invalid pointer was specified.
`E_UNEXPECTED` The call was not expected (for example, the scripting engine has not yet been loaded or initialized).

See also `IActiveScript::SetScriptSite`, `IActiveScriptSite`, `IActiveScriptSite::GetItemInfo`

`IActiveScript::Close`

```
HRESULT Close(void);
```

Causes the scripting engine to abandon any currently loaded script, lose its state, and release any interface pointers it has to other objects, thus entering a closed state. Event sinks, immediately executed script text, and macro invocations that are already in progress are completed before the state changes (use `InterruptScriptThread` to cancel a running script thread). This method must be called by the creating host before it calls `Release` to prevent circular reference problems.

Returns

`S_OK` The script was successfully closed.
`S_FALSE` The method succeeded, but the script was already closed.
`OLESCRIPT_S_PENDING` The method was queued successfully, but the state hasn't changed yet. When the state changes, the site will be called back on `IActiveScriptSite::OnStateChange`.
`E_UNEXPECTED` The call was not expected (for example, the scripting engine was already in the closed state).

See also `IActiveScript::InterruptScriptThread`, `IActiveScriptSite::OnStateChange`

`IActiveScript::GetCurrentScriptThreadID`

```
HRESULT GetCurrentScriptThreadID(
    SCRIPTTHREADID *pscriptIdThread // receives scripting thread identifier
);
```

Retrieves a scripting-engine-defined identifier for the currently executing thread. The identifier can be used in subsequent calls to script thread execution-control methods such as `InterruptScriptThread`.

pscriptIdThread

[out] Address of a variable that receives the script thread identifier associated with the current thread. The interpretation of this identifier is left to the scripting engine, but it can be just a copy of the Windows thread identifier. If the Win32 thread terminates, this identifier becomes unassigned and can subsequently be assigned to another thread.

This method can be called from non-base threads without resulting in a non-base callout to host objects or to `IActiveScriptSite`.

Returns

S_OK The identifier was successfully retrieved.
E_POINTER An invalid pointer was specified.

See also [IActiveScript::InterruptScriptThread](#), [IActiveScriptSite](#)

IActiveScript::GetScriptDispatch

```
HRESULT GetScriptDispatch(
    LPCOLESTR pstrItemName // address of item name
    IDispatch **ppdisp      // receives IDispatch pointer
);
```

Retrieves the **IDispatch** interface for the methods and properties associated with the running script itself.

pstrItemName

[in] Address of a buffer that contains the name of the item for which the caller needs the associated dispatch object. If this parameter is NULL, the dispatch object contains as its members all of the global methods and properties defined by the script. Through the **IDispatch** interface and the associated **TypeInfo** interface, the host can invoke script methods or view and modify script variables.

ppdisp

[out] Address of a variable that receives a pointer to the object associated with the script's global methods and properties. If the scripting engine does not support such an object, NULL is returned.

Because methods and properties can be added by calling [IActiveScriptParse](#), the **IDispatch** interface returned by this function can dynamically support new methods and properties. Similarly, **IDispatch::GetTypeInfo** should return a new, unique **TypeInfo** when methods and properties are added. Note, however, that language engines must not change the **IDispatch** interface in a way that is incompatible with any previous **TypeInfo** interface returned. That implies, for example, that DISPIDs will never be reused.

Returns

S_OK The dispatch object for the script was successfully retrieved.
S_FALSE The scripting engine does not support a dispatch object; the *ppdisp* parameter is set to NULL.
E_UNEXPECTED The call was not expected (for example, the scripting engine has not yet been loaded or initialized).
E_POINTER An invalid pointer was specified.
E_INVALIDARG An argument was invalid.

IActiveScript::GetScriptSite

```
HRESULT GetScriptSite(
    REFIID iid, // interface identifier
    void **ppvSiteObject // address of host site interface
);
```

Retrieves the site object associated with the ActiveX Scripting engine.

iid

[in] Identifier of the requested interface.

ppvSiteObject

[out] Address of the location that receives the interface pointer to the host's site object.

Returns

S_OK The site object was successfully retrieved.
S_FALSE No site has been set; *ppvSiteObject* is set to NULL.
E_POINTER An invalid pointer was specified.
E_INVALIDARG An argument was invalid.
E_NOINTERFACE The specified interface is not supported.

IAActiveScript::GetScriptState

```
HRESULT GetScriptState(
    SCRIPTSTATE *pss // address of structure for state information
);
```

Retrieves the current state of the scripting engine. This method can be called from non-base threads without resulting in a non-base callout to host objects or to IAActiveScriptSite.

pss

[out] Address of a variable that receives a value defined in the **SCRIPTSTATE** enumeration. The value indicates the current state of the scripting engine associated with the calling thread.

Returns

S_OK The state information was successfully retrieved.
E_POINTER An invalid pointer was specified.

See also IAActiveScriptSite, **SCRIPTSTATE**

IAActiveScript::GetScriptThreadID

```
HRESULT GetScriptThreadID(
    DWORD dwWin32ThreadID, // Win32 thread identifier
    SCRIPTTHREADID *pstidThread // receives scripting thread identifier
);
```

Retrieves a scripting-engine-defined identifier for the thread associated with the given Win32 thread. This identifier can be used in subsequent calls to script thread execution control methods such as InterruptScriptThread.

dwWin32ThreadID

[in] Thread identifier of a running Win32 thread in the current process. Use the GetCurrentScriptThreadID function to retrieve the thread identifier of the currently executing thread.

pstidThread

[out] Address of a variable that receives the script thread identifier associated with the given Win32 thread. The interpretation of this identifier is left to the scripting engine, but it can be just a copy of the Windows thread identifier. Note that if the Win32 thread terminates, this identifier becomes unassigned and may subsequently be assigned to another thread.

This method can be called from non-base threads without resulting in a non-base callout to host objects or to IAActiveScriptSite.

Returns

S_OK The identifier was successfully retrieved.
E_POINTER An invalid pointer was specified.
E_UNEXPECTED The call was not expected (for example, the scripting engine has not yet been loaded or initialized).

See also [IActiveScript::InterruptScriptThread](#), [IActiveScriptSite](#)

IActiveScript::GetScriptThreadState

```
HRESULT GetScriptThreadState(
    SCRIPTTHREADID stidThread,    // identifier of script thread
    SCRIPTTHREADSTATE *pstsState // receives state flag
);
```

Retrieves the current state of a script thread.

stidThread

[in] Identifier of the thread for which the state is desired, or one of the following special thread identifiers:

Value	Meaning
SCRIPTTHREADID_CURRENT	The currently executing thread.
SCRIPTTHREADID_BASE	The base thread; that is, the thread in which the scripting engine was instantiated.

pstsState

[out] Address of a variable that receives the state of the indicated thread. The state is indicated by one of the named constant values defined by the [SCRIPTTHREADSTATE](#) enumeration. If this parameter does not identify the current thread, the state may change at any time.

This method can be called from non-base threads without resulting in a non-base callout to host objects or to [IActiveScriptSite](#).

Returns

S_OK The current state was successfully retrieved.
 E_POINTER An invalid pointer was specified.
 E_UNEXPECTED The call was not expected (for example, the scripting engine has not yet been loaded or initialized).

See also [IActiveScriptSite](#), [SCRIPTTHREADSTATE](#)

IActiveScript::InterruptScriptThread

```
HRESULT InterruptScriptThread(
    SCRIPTTHREADID stidThread, // identifier of thread
    const EXCEPINFO *pexceinfo, // receives error information
    DWORD dwFlags
);
```

Interrupts the execution of a running script thread (an event sink, an immediate execution, or a macro invocation). This method can be used to terminate a script that is stuck (for example, in an infinite loop). It can be called from non-base threads without resulting in a non-base callout to host objects or to [IActiveScriptSite](#).

stidThread

[in] Thread identifier of the thread to interrupt, or one of the following special thread identifier values:

Value	Meaning
SCRIPTTHREADID_CURRENT	The currently executing thread.
SCRIPTTHREADID_BASE	The base thread; that is, the thread in which the scripting engine was instantiated.
SCRIPTTHREADID_ALL	All threads. The interrupt is applied to all script methods

currently in progress. Note that unless the caller has requested that the script be disconnected, by calling SetScriptState with the SCRIPTSTATE_DISCONNECTED or SCRIPTSTATE_INITIALIZED flag, the next scripted event causes script code to run again.

pexceinfo

[in] Address of an **EXCEPINFO** structure that receives error information associated with the error condition.

dwFlags

[in] Option flags associated with the interruption. Can be one of these values:

SCRIPTINTERRUPT_DEBUG

If supported, enter the scripting engine's debugger at the current script execution point.

SCRIPTINTERRUPT_RAISEEXCEPTION

If supported by the scripting engine's language, let the script handle the exception. Otherwise, the script method is aborted and the error code is returned to the caller; that is, the event source or macro invoker.

Returns

S_OK The given thread was successfully interrupted.
E_POINTER An invalid pointer was specified.
E_INVALIDARG An argument was invalid.
E_UNEXPECTED The call was not expected (for example, the scripting engine has not yet been loaded or initialized).

See also IActiveScript::SetScriptState, IActiveScriptSite

IActiveScript::SetScriptSite

```
HRESULT SetScriptSite(  
    IActiveScriptSite *pScriptSite // address of host script site  
);
```

Informs the scripting engine of the IActiveScriptSite site provided by the host. This method must be called before any other IActiveScript methods can be used.

pScriptSite

[in] Address of the host-supplied script site to be associated with this instance of the scripting engine. The site must be uniquely assigned to this scripting engine instance; it cannot be shared with other scripting engines.

Returns

S_OK The host site was set successfully.
E_POINTER An invalid pointer was specified.
E_INVALIDARG An argument was invalid.
E_FAIL An unspecified error occurred; the scripting engine was unable to finish initializing the site.
E_UNEXPECTED The call was not expected (for example, a site was already set).

See also IActiveScriptSite

IActiveScript::SetScriptState

```
HRESULT SetScriptState(  
    SCRIPTSTATE ss // identifier of new state
```

Puts the scripting engine into the given state. This method can be called from non-base threads without resulting in a non-base callout to host objects or to IActiveScriptSite.

ss

[in] Sets the scripting engine to the given state. Can be one of the values defined in the SCRIPTSTATE enumeration:

SCRIPTSTATE_INITIALIZED

Returns the scripting engine back to the initialized state from the started, connected, or disconnected state. Because languages can vary widely in semantics, scripting engines are not required to support this state transition. Engines that support IActiveScript::Clone must, however, support this state transition. Hosts must prepare for this transition and take the appropriate action: **Release** the current scripting engine, create a new scripting engine, and call Load or InitNew (and possibly also call ParseScriptText). Use of this transition should be considered an optimization of the above steps. Note that any information the scripting engine has obtained about the names of Named Items and the type information describing Named Items remains valid.

Because languages vary widely, defining the exact semantics of this transition is difficult. At a minimum, the scripting engine must disconnect from all events, and release all of the SCRIPTINFO IUNKNOWN pointers obtained by calling IActiveScriptSite::GetItemInfo. The engine must refetch these pointers after the script is run again. The scripting engine should also reset the script back to an initial state that is appropriate for the language. VBScript, for example, resets all variables and retains any code added dynamically by calling IActiveScriptParse with the SCRIPTTEXT ISPERSISTENT flag set. Other languages may need to retain current values (such as Lisp because there is no code/data separation) or reset to a well-known state (this includes languages with statically initialized variables). These languages may or may not retain code added by calling IActiveScriptParse.

Note that the transition to the started state should have the same semantics (that is, it should leave the scripting engine in the same state) as calling IPersist*::Save to save the scripting engine, and then calling IPersist*::Load to load a new scripting engine; these actions should have the same semantics as IActiveScript::Clone. Scripting engines that do not yet support Clone or IPersist* should carefully consider how the transition to the started state should behave, so that such a transition would not violate the above conditions if Clone or IPersist* support was later added.

During this transition to the started state, the scripting engine will disconnect from event sinks after the appropriate destructors, and so on, are executed in the script. To avoid having these destructors executed, the host can first move the script into the disconnected state before moving into the started state.

Use InterruptScriptThread to cancel a running script thread without waiting for current events, and so on, to finish running.

SCRIPTSTATE_STARTED

The transition to this mode causes any code that was queued during the initialized state to be executed. From this state, script code can be executed, for example, by calling IActiveScriptParse::ParseScriptText or by calling the IDispatch interface obtained from IActiveScript::GetScriptDispatch. The transition to this state is also the appropriate time to execute routines such as a main()-like script routine, if appropriate for the script language.

SCRIPTSTATE_CONNECTED

Causes the script to connect to events. If this is a transition from the initialized state, the scripting engine should transition through the started state, performing the necessary actions, before entering the connected state and connecting to events.

SCRIPTSTATE_DISCONNECTED

Causes the script to disconnect from event sinks. This can be done either *logically* (ignoring events received) or *physically* (calling **Unadvise** on the appropriate connection points). Returning to the connected state reverses this process. If this is a transition from the initialized state, the scripting engine should transition through the started state, performing the necessary actions, before entering the disconnected state. Event sinks that are in progress are completed before the state changes (use **InterruptScriptThread** to cancel a running script thread). The script's execution state is maintained. For example, an HTML browser may put the scripting engine into this state when a scripted HTML page is moved into the LRU cache, before the page is actually destroyed.

Returns

S_OK	The script successfully entered the given state.
S_FALSE	The method succeeded, but the script was already in the given state.
OLESCRIPT_S_PENDING	The method was queued successfully, but the state hasn't changed yet. When the state changes, the site will be called back through the IActiveScriptSite::OnStateChange method.
E_FAIL	The scripting engine does not support the transition back to the <u>initialized</u> state. The host must discard this scripting engine and create, initialize, and load a new scripting engine to achieve the same effect.
E_UNEXPECTED	The call was not expected (for example, the scripting engine has not yet been loaded or initialized).

See also **IActiveScript::Clone**, **IActiveScript::GetScriptDispatch**, **IActiveScript::InterruptScriptThread**, **IActiveScriptParse::ParseScriptText**, **IActiveScriptSite**, **IActiveScriptSite::GetItemInfo**, **IActiveScriptSite::OnStateChange**, **SCRIPTSTATE**

IActiveScriptParse

If the ActiveX Scripting engine allows raw text code scriptlets to be added to the script, or allows expression text to be evaluated at run time, it implements **IActiveScriptParse**. For interpreted scripting languages that have no independent authoring environment, such as Visual Basic Script, this provides an alternate mechanism (other than **IPersist***) to get script code into the scripting engine, and to attach script fragments to various object events.

Methods in Vtable Order

IActiveScriptParse methods

Unknown methods	Description
QueryInterface	Returns pointers to supported interfaces.
AddRef	Increments the reference count.
Release	Decrements the reference count.
IActiveScriptParse methods	Description
InitNew	Initializes the scripting engine.
AddScriptlet	Adds a code scriptlet to the script.
ParseScriptText	Parses the given code scriptlet, adding declarations into the name space and evaluating code as appropriate.

IActiveScriptParse::AddScriptlet

```

HRESULT AddScriptlet(
    LPCOLESTR pstrDefaultName,    // address of default name of scriptlet
    LPCOLESTR pstrCode,           // address of scriptlet text
    LPCOLESTR pstrItemName,       // address of item name
    LPCOLESTR pstrSubItemName,    // address of subitem name
    LPCOLESTR pstrEventName,      // address of event name
    LPCOLESTR pstrEndDelimiter,   // address of end-of-scriptlet delimiter
    DWORD dwFlags,               // scriptlet flags
    BSTR *pbstrName,             // address of actual name of scriptlet
    EXCEPINFO *pexcepinfo        // address of exception information
);

```

Adds a code scriptlet to the script. This method is used in environments where the persistent state of the script is intertwined with the host document and must be restored under the host's control, rather than through *IPersist**. The primary examples are HTML scripting languages that allow scriptlets of code embedded in the HTML document to be attached to intrinsic events (for example, **ONCLICK**="button1.text='Exit'").

pstrDefaultName

[in] Address of a default name to associate with the scriptlet. If the scriptlet does not contain naming information (as in the **ONCLICK** example above), this name will be used to identify the scriptlet. If this parameter is NULL, the scripting engine manufactures a unique name, if necessary.

pstrCode

[in] Address of the scriptlet text to add. The interpretation of this string depends on the scripting language.

pstrItemName

[in] Address of a buffer that contains the item name associated with this scriptlet. This parameter, in addition to *pstrSubItemName*, identifies the object for which the scriptlet is an event handler.

pstrSubItemName

[in] Address of a buffer that contains the name of a subobject of the named item with which this scriptlet is associated; this name must be found in the named item's type information. This parameter is NULL if the scriptlet is to be associated with the named item instead of a subitem. This parameter, in addition to *pstrItemName*, identifies the specific object for which the scriptlet is an event handler.

pstrEventName

[in] Address of a buffer that contains the name of the event for which the scriptlet is an event handler.

pstrEndDelimiter

[in] Address of the end-of-scriptlet delimiter. When *pstrCode* is parsed from a stream of text, the host typically uses a delimiter, such as two single quotation marks ('), to detect the end of the scriptlet. This parameter specifies the delimiter that the host used, allowing the scripting engine to provide some conditional primitive preprocessing (for example, replacing a single quotation mark ['] with two single quotation marks for use as a delimiter). Exactly how (and if) the scripting engine makes use of this information depends on the scripting engine. Set this parameter to NULL if the host did not use a delimiter to mark the end of the scriptlet.

dwFlags

[in] Flags associated with the scriptlet. Can be a combination of the following values:

Value	Meaning
SCRIPTTEXT_ISVISIBLE	Indicates that the script text should be visible (and, therefore, callable by name) as a global method in the name space of the script.
SCRIPTTEXT_ISPERSISTENT	Indicates that the code added during this call should be saved if the scripting engine is saved (for example, through a call to <i>IPersist*::Save</i>), or if the scripting engine is reset

by way of a transition back to the initialized state.

pbstrName

[out] The actual name used to identify the scriptlet. This will be, in order of preference: a name explicitly specified in the scriptlet text, the default name provided in *pstrDefaultName*, or a unique name synthesized by the scripting engine.

pexceinfo

[out] Pointer to a structure containing exception information. This structure should be filled in if DISP_E_EXCEPTION is returned.

Returns

S_OK	The scriptlet was successfully added to the script--the <i>pbstrName</i> parameter contains the scriptlet's name.
OLESCRIPT_E_INVALIDNAME	The default name supplied is invalid in this scripting language.
OLESCRIPT_E_SYNTAX	An unspecified syntax error occurred in the scriptlet.
DISP_E_EXCEPTION	An exception occurred in the parsing of the scriptlet; the <i>pexceinfo</i> parameter contains information about the exception.
E_UNEXPECTED	The call was not expected (for example, the scripting engine has not yet been loaded or initialized).
E_NOTIMPL	This method is not supported; the scripting engine does not support adding event-sinking scriptlets.
E_POINTER	An invalid pointer was specified.
E_INVALIDARG	An argument was invalid.

IActiveScriptParse::InitNew

HRESULT InitNew(void);

Initializes the scripting engine.

Before the scripting engine can be used, one of the following methods must be called: **IPersist*::Load**, **IPersist*::InitNew**, or **IActiveScriptParse::InitNew**. The semantics of this method are identical to **IPersistStreamInit::InitNew**, in that this method tells the scripting engine to initialize itself. Note that it is not valid to call both **InitNew** and **Load**, nor is it valid to call **InitNew** or **Load** more than once.

Returns

S_OK The scripting engine was successfully initialized.
E_FAIL An error occurred during initialization.

IActiveScriptParse::ParseScriptText

```
HRESULT ParseScriptText(
    LPCOLESTR pstrCode,           // address of scriptlet text
    LPCOLESTR pstrItemName,       // address of item name
    IUnknown *punkContext,        // address of debugging context
    LPCOLESTR pstrEndDelimiter,   // address of end-of-scriptlet delimiter
    DWORD dwFlags,                // scriptlet flags
    VARIANT *pvarResult,          // address of buffer for results
    EXCEPINFO *pexceinfo          // address of buffer for error data
);
```

Parses the given code scriptlet, adding declarations into the name space and evaluating code as appropriate.

pstrCode

[in] Address of the scriptlet text to evaluate. The interpretation of this string depends on the scripting language.

pstrItemName

[in] Address of the item name that gives the context in which the scriptlet is to be evaluated. If this parameter is NULL, the code is evaluated in the scripting engine's global context.

punkContext

[in] Address of context object. This object is reserved for use in a debugging environment, where such a context may be provided by the debugger to represent an active run-time context. If this parameter is NULL, the engine uses *pstrItemName* to identify the context.

pstrEndDelimiter

[in] Address of the end-of-scriptlet delimiter. When *pstrCode* is parsed from a stream of text, the host typically uses a delimiter, such as two single quotation marks (""), to detect the end of the scriptlet. This parameter specifies the delimiter that the host used, allowing the scripting engine to provide some conditional primitive preprocessing (for example, replacing a single quotation mark ['] with two single quotation marks for use as a delimiter). Exactly how (and if) the scripting engine makes use of this information depends on the scripting engine. Set this parameter to NULL if the host did not use a delimiter to mark the end of the scriptlet.

dwFlags

[in] Flags associated with the scriptlet. Can be a combination of these values:

Value	Meaning
SCRIPTTEXT_ISEXPRESSION	If the distinction between a computational expression and a statement is important but syntactically ambiguous in the script language, this flag specifies that the scriptlet is to be interpreted as an expression, rather than as a statement or list of statements. By default, statements are assumed unless the correct choice can be determined from the syntax of the scriptlet text.
SCRIPTTEXT_ISPERSISTENT	Indicates that the code added during this call should be saved if the scripting engine is saved (for example, through a call to <i>IPersist*::Save</i>), or if the scripting engine is reset by way of a transition back to the <u>initialized</u> state.
SCRIPTTEXT_ISVISIBLE	Indicates that the script text should be <u>visible</u> (and, therefore, callable by name) as a global method in the name space of the script.

pvarResult

[out] Address of a buffer that receives the results of scriptlet processing, or NULL if the caller expects no result (that is, the **SCRIPTTEXT_ISEXPRESSION** value is not set).

pexcepinfo

[out] Address of a structure that receives exception information. This structure is filled if **ParseScriptText** returns **DISP_E_EXCEPTION**.

If the scripting engine is in the initialized state, no code will actually be evaluated during this call; rather, such code is queued and executed when the scripting engine is transitioned into (or through) the started state. Because execution is not allowed in the initialized state, it is an error to call this method with the **SCRIPTTEXT_ISEXPRESSION** flag when in the initialized state.

The scriptlet can be an expression, a list of statements, or anything allowed by the script language. For example, this method is used in the evaluation of the HTML `<SCRIPT>` tag, which allows statements to be executed as the HTML page is being constructed, rather than just compiling them into the script state.

The code passed to this method must be a valid, complete portion of code. For example, in VBScript it is illegal to call this method once with **Sub Foo(x)** and then a second time with **End Sub**. The parser must not wait for the second call to complete the subroutine, but rather must generate a parse error because a subroutine declaration was started but not completed.

Returns**S_OK**

The expression or statement(s) has been evaluated. The *pvarResult* parameter contains the result, if any.

E_POINTER

An invalid pointer was specified.

E_INVALIDARG

An argument was invalid.

E_UNEXPECTED

The call was not expected (for example, the scripting engine is in the uninitialized or closed state, or the **SCRIPTTEXT_ISEXPRESSION** flag was set and the scripting engine is in the initialized state).

DISP_E_EXCEPTION

An exception occurred in the processing of the scriptlet. The *pexceptinfo* parameter contains information about the exception.

OLESCRIPT_E_SYNTAX

An unspecified syntax error occurred in the scriptlet.

E_NOTIMPL

This method is not supported. The scripting engine does not support run-time evaluation of expressions or statements.

IScriptError

An object implementing this interface is passed to **IScriptSite::OnScriptError** whenever the scripting engine encounters an unhandled error. The host then calls methods on this object to obtain information about the error that occurred.

Methods in Vtable Order**IUnknown methods****QueryInterface**

Returns pointers to supported interfaces.

AddRef

Increments the reference count.

Release

Decrements the reference count.

IScriptError methods**Description****GetExceptionInfo**

Retrieves information about an error.

GetSourcePosition

Retrieves the location in the source code where an error occurred.

GetSourceLineText

Retrieves the line in the source file where an error occurred.

IScriptError::GetExceptionInfo

```
HRESULT GetExceptionInfo(
    EXCEPINFO *pexceptinfo // structure for exception information
);
```

Retrieves information about an error that occurred while the scripting engine was running a script.

pexceptinfo

[out] Address of an **EXCEPINFO** structure that receives error information.

Returns**S_OK** The error information was successfully retrieved.**E_FAIL** An error occurred.**IScriptError::GetSourceLineText**

```

HRESULT GetSourceLineText(
    BSTR *pbstrSourceLine // address of buffer for source line
);

```

Retrieves the line in the source file where an error occurred while a scripting engine was running a script.

pbstrSourceLine

[out] Address of a buffer that receives the line of source code in which the error occurred.

Returns

S_OK The line in the source file was successfully retrieved.

E_FAIL An error occurred.

IActiveScriptError::GetSourcePosition

```

HRESULT GetSourcePosition(
    DWORD *pdwSourceContext, // context cookie
    ULONG *pullLineNumber,   // line number of error
    LONG *pichCharPosition   // character position of error
);

```

Retrieves the location in the source code where an error occurred while the scripting engine was running a script.

pdwSourceContext

[out] Address of a variable that receives a cookie that identifies the context. The interpretation of this parameter depends on the host application.

pullLineNumber

[out] Address of a variable that receives the line number in the source file where the error occurred.

pichCharPosition

[out] Address of a variable that receives the character position in the line where the error occurred.

Returns

S_OK The error location was successfully retrieved.

E_FAIL An error occurred.

IActiveScriptSite

The host must create a site for the ActiveX Scripting engine by implementing **IActiveScriptSite**. Usually, this site will be associated with the container of all the objects that are visible to the script (for example, the ActiveX controls). Typically, this container will correspond to the document or page being viewed. Internet Explorer, for example, would create such a container for each HTML page being displayed. Each ActiveX control (or other automation object) on the page, and the scripting engine itself, would be enumerable within this container.

Methods in Vtable Order

IUnknown methods Description

QueryInterface Returns pointers to supported interfaces.

AddRef Increments the reference count.

Release Decrements the reference count.

IActiveScriptSite Description
methods

<u>GetLCID</u>	Retrieves the locale identifier that the host uses for displaying user-interface elements.
<u>GetItemInfo</u>	Obtains information about an item that was added to an engine through a call to the <u>IActiveScript::AddNamedItem</u> method.
<u>GetDocVersionString</u>	Retrieves a host-defined string that uniquely identifies the current document version from the host's point of view.
<u>OnScriptTerminate</u>	Informs the host that the script has completed execution.
<u>OnStateChange</u>	Informs the host that the scripting engine has changed states.
<u>OnScriptError</u>	Informs the host that an execution error occurred while the engine was running the script.
<u>OnEnterScript</u>	Informs the host that the scripting engine has begun executing the script code.
<u>OnLeaveScript</u>	Informs the host that the scripting engine has returned from executing script code.

IActiveScriptSite::GetDocVersionString

```
HRESULT GetDocVersionString(
    BSTR *pbstrVersionString // address of document version string
);
```

Retrieves a host-defined string that uniquely identifies the current document version from the host's point of view. If the related document has changed outside the scope of ActiveX Scripting (as in the case of an HTML page being edited with NotePad), the scripting engine can save this along with its persisted state, forcing a recompile the next time the script is loaded.

pbstrVersionString
[out] Address of the host-defined document version string.

Returns

S_OK The document version string was successfully retrieved. The *pbstrVersionString* parameter contains the string.

E_NOTIMPL This method is not supported. The scripting engine should assume that the script is in sync with the document.

IActiveScriptSite::GetItemInfo

```
HRESULT IActiveScriptSite::GetItemInfo(
    LPCOLESTR pstrName, // address of item name
    DWORD dwReturnMask, // bit mask for information retrieval
    IUnknown **ppunkItem, // address of pointer to item's IUnknown
    ITypeInfo **ppTypeInfo // address of pointer to item's ITypeInfo
);
```

Allows the scripting engine to obtain information about an item added with IActiveScript::AddNamedItem.

pstrName

[in] The name associated with the item, as specified in IActiveScript::AddNamedItem.

dwReturnMask

[in] A bit mask specifying what information about the item should be returned. The scripting engine should request the minimum needed information because some of the return parameters (for example, *ITypeInfo*) can take considerable time to load or generate. Can be a combination of the following values:

Value	Meaning
SCRIPTINFO_IUNKNOWN	Return the <i>IUnknown</i> interface for this item.

SCRIPTINFO_ITypeInfo Return the **ITypeInfo** interface for this item.

ppunkItem

[out] Address of a variable that receives a pointer to the **IUnknown** interface associated with the given item. The scripting engine can use the **QueryInterface** method to obtain the **IDispatch** interface for the item. This parameter receives **NULL** if **dwReturnMask** does not include the **SCRIPTINFO_IUNKNOWN** value. Also, it receives **NULL** if there is no object associated with the item name; this mechanism is used to create a simple class when the named item was added with the **SCRIPTITEM_CODEONLY** flag set.

ppTypeInfo

[out] Address of a variable that receives a pointer to the **ITypeInfo** interface associated with the item. This parameter receives **NULL** if **dwReturnMask** does not include the **SCRIPTINFO_ITypeInfo** value, or if type information is not available for this item. If type information is not available, the object cannot source events, and name binding must be realized with **IDispatch::GetIDsOfNames**. Note that this **ITypeInfo** describes the coclass (**TKIND_COCLASS**) because the object may support multiple interfaces and event interfaces. If the item supports the **IProvideMultipleTypeInfo** interface, the **ITypeInfo** interface corresponds to the **ITypeInfo** of index zero obtained from **IProvideMultipleTypeInfo::GetInfoOfIndex**.

This method retrieves only the information indicated by the **dwReturnMask** parameter. This improves performance, for example, in the case where an **ITypeInfo** interface is not needed for an item.

Returns

S_OK	The requested interface pointer was successfully retrieved. The ppunkItem or ppTypeInfo parameter contains the pointer.
E_POINTER	An invalid pointer was specified.
E_INVALIDARG	An argument was invalid.
TYPE_E_ELEMENTNOTFOUND	An item of the specified name was not found.

See also **IActiveScript::AddNamedItem**

IActiveScriptSite::GetLCID

```
HRESULT GetLCID(
    LCID *plcid // address of variable for language identifier
);
```

Retrieves the locale identifier associated with the host's user interface. The scripting engine uses the identifier to ensure that error strings and other user-interface elements surfaced by the engine appear in the appropriate language. If this method returns **E_NOTIMPL**, the system-defined locale identifier should be used.

plcid

[out] Address of a variable that receives the locale identifier for user-interface elements displayed by the scripting engine.

Returns

S_OK	The locale identifier was successfully retrieved. The plcid parameter contains the identifier.
E_POINTER	An invalid pointer was specified.
E_NOTIMPL	This method is not implemented. Use the system-defined locale.

IActiveScriptSite::OnEnterScript

HRESULT OnEnterScript (void);

Informs the host that the scripting engine has begun executing the script code.

The scripting engine must call this method on every entry or reentry into the scripting engine. For example, if the script calls an object that then fires an event handled by the scripting engine, the scripting engine must call **OnEnterScript** before executing the event, and must call **OnLeaveScript** after executing the event but before returning to the object that fired the event. Calls to this method can be nested. Every call to **OnEnterScript** requires a corresponding call to **OnLeaveScript**.

Returns

S_OK The method succeeded.

See also [IActiveScriptSite::OnLeaveScript](#)

IActiveScriptSite::OnLeaveScript

HRESULT IActiveScriptSite::OnLeaveScript (void);

Informs the host that the scripting engine has returned from executing script code.

The scripting engine must call this method before returning control to a caller that entered the scripting engine. For example, if the script calls an object that then fires an event handled by the scripting engine, the scripting engine must call **OnEnterScript** before executing the event, and must call **OnLeaveScript** after executing the event before returning to the object that fired the event. Calls to this method can be nested. Every call to **OnEnterScript** requires a corresponding call to **OnLeaveScript**.

Returns

S_OK The method was successful.

See also [IActiveScriptSite::OnEnterScript](#)

IActiveScriptSite::OnScriptError

**HRESULT IActiveScriptSite::OnScriptError(
 IActiveScriptError* pase // address of error interface
);**

Informs the host that an execution error occurred while the engine was running the script.

pase

[in] Address of the error object's [IActiveScriptError](#) interface. A host can use this interface to obtain information about the execution error.

Returns

S_OK The scripting engine should continue running the script as best as possible (perhaps abandoning the processing of this event).

S_FALSE The scripting engine should continue running the script in the debugger, if a debugger is available. If a debugger is not available, this error should be handled in the same way as **E_FAIL**.

E_FAIL The scripting engine should abort execution of the script and return it to the initialized state. In this case, the *pexcepinfo* parameter obtained from [IActiveScriptError::GetExceptionInfo](#) is generally passed to [OnScriptTerminate](#).

See also [IActiveScriptError](#), [IActiveScriptError::GetExceptionInfo](#)

IActiveScriptSite::OnScriptTerminate

```
HRESULT OnScriptTerminate(
    VARIANT *pvarResult,    // address of script results
    EXCEPINFO *pexcepinfo   // address of structure with exception information
);
```

Informs the host that the script has completed execution.

pvarResult

[in] Address of a variable that contains the script result, or NULL if the script produced no result.

pexcepinfo

[in] Address of an EXCEPINFO structure that contains exception information generated when the script terminated, or NULL if no exception was generated.

The scripting engine calls this method before the call to OnStateChange(SCRIPTSTATE_INITIALIZED) is completed. The OnScriptTerminate method can be used to return completion status and results to the host. Note that many script languages, which are based on sinking events from the host, have life spans that are defined by the host. In this case, this method may never be called.

Returns

S_OK The method succeeded.

IActiveScriptSite::OnStateChange

```
HRESULT IActiveScriptSite::OnStateChange(
    SCRIPTSTATE ssScriptState // new state of engine
);
```

Informs the host that the scripting engine has changed states.

ssScriptState

[in] Value that indicates the new script state. See IActiveScript::GetScriptState for a description of the states.

Returns

S_OK The method succeeded.

See also IActiveScript::GetScriptState

IActiveScriptSiteWindow

This interface is implemented by hosts that support a user interface on the same object as IActiveScriptSite. Hosts that do not support a user interface, such as servers, would not implement the IActiveScriptSiteWindow interface. The scripting engine accesses this interface by calling QueryInterface from IActiveScriptSite.

Methods in Vtable Order**Unknown methods Description**

QueryInterface Returns pointers to supported interfaces.

AddRef Increments the reference count.

Release Decrements the reference count.

IActiveScriptSiteWindow Description**methods**

GetWindow Retrieves the window handle that can act as the owner of a

EnableModeless

pop-up window that the scripting engine needs to display. Causes the host to enable or disable its main window as well as any modeless dialog boxes.

IActiveScriptSite::EnableModeless

```
HRESULT IActiveScriptSite::EnableModeless(
    BOOL fEnable // enable flag
);
```

Causes the host to enable or disable its main window as well as any modeless dialog boxes.

fEnable

[in] Flag that, if TRUE, enables the main window and modeless dialogs or, if FALSE, disables them.

This method is identical to **IOleInPlaceFrame::EnableModeless**.

Calls to this method can be nested.

Returns

S_OK The method was successful.

E_FAIL An error occurred.

IActiveScriptSite::GetWindow

```
HRESULT GetWindow(
    HWND *phwnd // address of variable for window handle
);
```

Retrieves the handle of a window that can act as the owner of a pop-up window that the scripting engine needs to display.

phwnd

[out] Address of a variable that receives the window handle.

This method is similar to **IOleWindow::GetWindow**.

Returns

S_OK The window handle was successfully retrieved.

E_FAIL An error occurred.

Enumerations**SCRIPTSTATE**

```
typedef enum tagSCRIPTSTATE {
    SCRIPTSTATE_UNINITIALIZED = 0,
    SCRIPTSTATE_INITIALIZED   = 5,
    SCRIPTSTATE_STARTED       = 1,
    SCRIPTSTATE_CONNECTED     = 2,
    SCRIPTSTATE_DISCONNECTED  = 3,
    SCRIPTSTATE_CLOSED        = 4
} SCRIPTSTATE;
```

Contains named constant values that specify the state of a scripting engine. This enumeration is used by the IActiveScript::GetScriptState, IActiveScript::SetScriptState, and IActiveScriptSite::OnStateChange methods.

Elements

SCRIPTSTATE_UNINITIALIZED	The script has just been created, but has not yet been initialized using an <u>IPersist*</u> interface and <u>IActiveScript::SetScriptSite</u> .
SCRIPTSTATE_INITIALIZED	The script has been initialized, but is not running (connecting to other objects or sinking events) or executing any code. Code can be queried for execution by calling <u>IActiveScriptParse::ParseScriptText</u> .
SCRIPTSTATE_STARTED	The script can execute code, but is not yet sinking the events of objects added by the <u>IActiveScript::AddNamedItem</u> method.
SCRIPTSTATE_CONNECTED	The script is loaded and connected for sinking events.
SCRIPTSTATE_DISCONNECTED	The script is loaded and has a run-time execution state, but is temporarily disconnected from sinking events.
SCRIPTSTATE_CLOSED	The script has been closed. The scripting engine no longer works and returns errors for most methods.

See also IActiveScript::GetScriptState, IActiveScript::SetScriptState, IActiveScriptSite::OnStateChange

SCRIPTTHREADSTATE

```
typedef enum tagSCRIPTTHREADSTATE {
    SCRIPTTHREADSTATE_NOTINSCRIPT = 0,
    SCRIPTTHREADSTATE_RUNNING    = 1,
} SCRIPTTHREADSTATE;
```

Contains named constant values that specify the state of a thread in a scripting engine. This enumeration is used by the IActiveScript::GetScriptThreadState method.

Elements**SCRIPTTHREADSTATE_NOTINSCRIPT**

The specified thread is not currently servicing a scripted event, processing immediately executed script text, or running a script macro.

SCRIPTTHREADSTATE_RUNNING

The specified thread is actively servicing a scripted event, processing immediately executed script text, or running a script macro.

See also IActiveScript::GetScriptThreadState

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APPENDIX B

Active Debugging Environment Interfaces

Language Engine

IScriptDebug; // provides syntax coloring and code context enumeration
IScriptErrorDebug; // returns document contexts and stack frames for errors
IScriptSiteDebug; // host provided link from script engine to debugger
IScriptTextInfo; // Language engine debugging abstractions
IDebugCodeContext; // a virtual "instruction pointer" in a thread
IEnumDebugCodeContexts;
IDebugStackFrame; // logical stack frame on the stack of a thread
IDebugExpressionContext; // a context in which expressions can be evaluated
IDebugStackFrameSniffer; // enumerator for stack frames known by an engine
IDebugExpressionContext; // context for expression evaluation
IDebugExpression; // an asynchronously evaluated expression
IDebugSyncOperation;
IDebugAsyncOperation;
IDebugAsyncOperationCallback;
IDebugExpressionCallback; // status events for IDebugExpression evaluation progress
IEnumDebugExpressionContexts;
IProvideExpressionContexts; // Object browsing
IDebugFormatter;

Hosts

Smart-host Helper Interfaces

IDebugDocumentHelper; // implemented by PDM
IDebugDocumentHost; // implemented (optionally) by the host

Full Smart-host Interfaces

// implemented by host
IDebugDocumentInfo; // provides info on (possibly uninstantiated) doc
IDebugDocumentProvider; // allows doc to be instantiated on demand
IDebugDocument; // base document interface
IDebugDocumentText; // provides access to source text of document
IDebugDocumentTextEvents; // events fired when source text changes
IDebugDocumentTextAuthor;
IDebugDocumentContext; // represents a range within the document
// implemented by PDM on behalf of the host
IDebugApplicationNode; // represents the position of a doc in the hierarchy

`IDebugApplicationNodeEvents;` // events fired by PDM when document hierarchy changes

Debugger IDE

The IDE is a fully language independent debugging UI. It provides:

- Document viewers/editors.
- Breakpoint management.
- Expression evaluation and watch windows.
- Stack frame browsing.
- Object/Class browsing.
- Browsing the virtual application structure.

// Debugger implementation

`IDebugSessionProvider;` // establishes a debug session for a running application.
`IApplicationDebugger;` // primary interface exposed by a debugger IDE session

Machine Debug Manager

The machine debug manager provides the hookup point between virtual applications and debuggers by maintaining and enumerating a list of active virtual applications.

`IMachineDebugManager;`
`IMachineDebugManagerCookie;`
`IMachineDebugManagerEvents;`
`IEnumRemoteDebugApplications;`

Process Debug Manager

The PDM does the following:

- Synchronizes the debugging of multiple language engines.
- Maintains a tree of debuggable documents
- Merges stack frames.

- Coordinates breakpoints and stepping across language engines.
- Tracks threads.
- Maintains a debugger thread for asynchronous processing.
- Communicates with the machine debug manager and the debugger IDE.

The following are the interfaces provided by the process debug manager

```
IProcessDebugManager; // creates, adds and removes virtual applications, etc.
IRemoteDebugApplication; // virtual application abstraction
IDebugApplication;
IRemoteDebugApplicationThread; // virtual thread abstraction
IDebugApplicationThread;
IEnumRemoteDebugApplicationThreads;
IDebugThreadCall; // dispatches marshalled calls
IDebugApplicationNode; // maintains a position for a document in the hierarchy
IEnumDebugApplicationNodes;
IEnumDebugStackFrames; // merged enumeration of stack frames from engines
```

Structures and Enumerations

BREAKPOINT_STATE

```
// Indicates the state of a breakpoint
typedef enum tagBREAKPOINT_STATE {
BREAKPOINT_DELETED = 0, // Breakpoint no longer exists but references exist
BREAKPOINT_DISABLED = 1, // Breakpoint exists but is disabled
BREAKPOINT_ENABLED = 2 // Breakpoint exists and is enabled
} BREAKPOINT_STATE;
```

APPBREAKFLAGS

```
// Application break flags indicate the current application debug state and thread
typedef DWORD APPBREAKFLAGS;
// DEBUGGER_BLOCK
// languages should break immediately with BREAKREASON_DEBUGGER_BLOCK
const APPBREAKFLAGSAPPBREAKFLAG_DEBUGGER_BLOCK= 0x00000001;
// DEBUGGER_HALT
// languages should break immediately with BREAKREASON_DEBUGGER_HALT
const APPBREAKFLAGSAPPBREAKFLAG_DEBUGGER_HALT= 0x00000002;
// STEP
```

```
// languages should break immediately in the stepping thread with
BREAKREASON_STEP
const APPBREAKFLAGSAPPBREAKFLAG_STEP= 0x00010000;
// NESTED - the application is in nested execution on a breakpoint
const APPBREAKFLAGSAPPBREAKFLAG_NESTED= 0x00020000;
// STEP TYPES - defines whether we are stepping at source, bytecode, or machine level.
const APPBREAKFLAGSAPPBREAKFLAG_STEPTYPE_SOURCE= 0x00000000;
const APPBREAKFLAGSAPPBREAKFLAG_STEPTYPE_BYTECODE= 0x00100000;
const APPBREAKFLAGSAPPBREAKFLAG_STEPTYPE_MACHINE= 0x00200000;
const APPBREAKFLAGSAPPBREAKFLAG_STEPTYPE_MASK= 0x00F00000;
// BREAKPOINT IN_PROGRESS
const APPBREAKFLAGSAPPBREAKFLAG_IN_BREAKPOINT= 0x80000000;
```

BREAKREASON

```
// Indicates the cause of hitting a breakpoint
typedef enum tagBREAKREASON{
BREAKREASON_STEP, // Caused by the stepping mode
BREAKREASON_BREAKPOINT, // Caused by an explicit breakpoint
BREAKREASON_DEBUGGER_BLOCK, // Caused by another thread breaking
BREAKREASON_HOST_INITIATED, // Caused by host requested break
BREAKREASON_LANGUAGE_INITIATED, // Caused by a scripted break
BREAKREASON_DEBUGGER_HALT, // Caused by debugger IDE requested break
BREAKREASON_ERROR // Caused by an execution error
} BREAKREASON;
```

BREAKRESUME_ACTION

```
// How to continue from a breakpoint
typedef enum tagBREAKRESUME_ACTION{
BREAKRESUMEACTION_ABORT, // Abort the application
BREAKRESUMEACTION_CONTINUE, // Continue running
BREAKRESUMEACTION_STEP_INTO, // Step into a procedure
BREAKRESUMEACTION_STEP_OVER, // Step over a procedure
BREAKRESUMEACTION_STEP_OUT // Step out of the current procedure
} BREAKRESUMEACTION;
```

ERRORRESUME_ACTION

```
// How to continue from a run time error.
typedef enum tagERRORRESUMEACTION {
ERRORRESUMEACTION_ReexecuteErrorStatement, // re-execute the erroneous line
```

```

ERRORRESUMEACTION_AbortCallAndReturnErrorToCaller, // let language engine
handle the error
ERRORRESUMEACTION_SkipErrorStatement, // resume execution beyond the error
} ERRORRESUMEACTION;

```

DOCUMENTNAMETYPE

```

// The type of name desired for a document.
typedef enum tagDOCUMENTNAMETYPE {
DOCUMENTNAMETYPE_APPNODE, // Get name as it appears in the app tree
DOCUMENTNAMETYPE_TITLE, // Get name as it appears on the doc viewer title bar
DOCUMENTNAMETYPE_FILE_TAIL, // Get filename without a path (for save as...)
DOCUMENTNAMETYPE_URL, // Get URL of the document, if any
} DOCUMENTNAMETYPE;

```

SOURCE_TEXT_ATTR

```

// Attributes of a single character of source text.
typedef WORD SOURCE_TEXT_ATTR;
// The character is a part of a language keyword. Example: while
const SOURCE_TEXT_ATTR SOURCETEXT_ATTR_KEYWORD= 0x0001;
// The character is a part of a comment block.
const SOURCE_TEXT_ATTR SOURCETEXT_ATTR_COMMENT= 0x0002;
// The character is not part of compiled language source text. Example:
// the HTML surrounding script blocks.
const SOURCE_TEXT_ATTR SOURCETEXT_ATTR_NONSOURCE= 0x0004;
// The character is a part of a language operator. Example: *
const SOURCE_TEXT_ATTR SOURCETEXT_ATTR_OPERATOR= 0x0008;
// The character is a part of a language numeric constant. Example: 1234
const SOURCE_TEXT_ATTR SOURCETEXT_ATTR_NUMBER= 0x0010;
// The character is a part of a language string constant. Example: "Hello World"
const SOURCE_TEXT_ATTR SOURCETEXT_ATTR_STRING= 0x0020;
// The character indicates the start of a function block
const SOURCE_TEXT_ATTR SOURCETEXT_ATTR_FUNCTION_START = 0x0040;

```

TEXT_DOC_ATTR

```

// Document attributes
typedef DWORD TEXT_DOC_ATTR;
// Indicates that the document is read-only.
const TEXT_DOC_ATTR TEXT_DOC_ATTR_READONLY = 0x00000001;

```

Parse Flags

```

// Indicates that the text is an expression as opposed to a statement. This

```

```

// flag may affect the way in which the text is parsed by some languages.
const DWORD DEBUG_TEXT_ISEXPRESSION= 0x00000001;
// If a return value is available, it will be used by the caller.
const DWORD DEBUG_TEXT_RETURNVALUE= 0x00000002;
// Don't allow side effects. If this flag is set, the evaluation of the
// expression should change no runtime state.
const DWORD DEBUG_TEXT_NOSIDEEFFECTS= 0x00000004;
// Allow breakpoints during the evaluation of the text. If this flag is not
// set then breakpoints will be ignored during the evaluation of the text.
const DWORD DEBUG_TEXT_ALLOWBREAKPOINTS= 0x00000008;
// Allow error reports during the evaluation of the text. If this flag is not
// set then errors will not be reported to the host during the evaluation.
const DWORD DEBUG_TEXT_ALLOWERRORREPORT= 0x00000010;

```

Language/Script Engine Debugging Interfaces

Interfaces required by a language engine for debugging, browsing, & expression evaluation.

IAcrtiveScriptDebug

// Provides a way for smart hosts to take over document management and for the Process Debug Manager to synchronize debugging of multiple language engines.

```

[
    object,
    uuid(51973C10-CBOC-11d0-B5C9-00A0244A0E7A),
    pointer_default(unique)
]

```

interface IActiveScriptDebug : IUnknown

```

{
    // Returns the text attributes for an arbitrary block of script text. Smart hosts
    // use this call to delegate GetText calls made on their IDebugDocumentText.
    HRESULT GetScriptTextAttributes(
        // The script block text. This string need not be null terminated.
        [in, size_is(uNumCodeChars)]LPCOLESTRpstrCode,
        // The number of characters in the script block text.
        [in]ULONGuNumCodeChars,
        // See IActiveScriptParse::ParseScriptText for a description of this argument.
        [in]LPCOLESTRpstrDelimiter,
        // See IActiveScriptParse::ParseScriptText for a description of this argument.
        [in]DWORDdwFlags,
        // Buffer to contain the returned attributes.
        [in, out, size_is(uNumCodeChars)]SOURCE_TEXT_ATTR *pattr);
}

```

```

// Returns the text attributes for an arbitrary scriptlet. Smart hosts
// use this call to delegate GetText calls made on their IDebugDocumentText.
// Note: this call is provided because scriptlets tend to be expressions and
// may have a different syntax than a script block. For many languages the implementation
// will be identical to GetScriptTextAttributes.
HRESULT GetScriptletTextAttributes(
// The script block text. This string need not be null terminated.
[in, size_is(uNumCodeChars)]LPCOLESTRpstrCode,
// The number of characters in the script block text.
[in]ULONGuNumCodeChars,
// See IActiveScriptParse::AddScriptlet for a description of this argument.
[in]LPCOLESTRpstrDelimiter,
// See IActiveScriptParse::AddScriptlet for a description of this argument.
[in]DWORDdwFlags,
// Buffer to contain the returned attributes.
[in, out, size_is(uNumCodeChars)]SOURCE_TEXT_ATTR *pattr);

// Used by the smart host to delegate
IDebugDocumentContext::EnumDebugCodeContexts.
HRESULT EnumCodeContextsOfPosition(
[in]DWORD dwSourceContext,// As provided to IActiveScriptParse::ParseScriptText
// or IActiveScriptParse::AddScriptlet
[in]ULONG uCharacterOffset,// character offset relative
// to start of script text
[in]ULONG uNumChars,// Number of characters in context
// Returns an enumerator of code contexts.
[out] IEnumDebugCodeContexts **ppesc);
}

```

IActiveScriptSiteDebug

Implemented by smart hosts and is QI-able from IActiveScriptSite. It provides the means by which a smart host takes over document management and participates in debugging.

```

[
object,
uuid(51973C11-CB0C-11d0-B5C9-00A0244A0E7A),
pointer_default(unique),
local
]
interface IActiveScriptSiteDebug : IUnknown
{
// Used by the language engine to delegate IDebugCodeContext::GetSourceContext.
HRESULT GetDocumentContextFromPosition(
[in]DWORD dwSourceContext,// As provided to ParseScriptText
// or AddScriptlet

```

```

[in]ULONG uCharacterOffset,// character offset relative
// to start of script block or scriptlet
[in]ULONG uNumChars,// Number of characters in context
// Returns the document context corresponding to this character-position range.
[out] IDebugDocumentContext **ppsc);

// Returns the debug application object associated with this script site. Provides
// a means for a smart host to define what application object each script belongs to.
// Script engines should attempt to call this method to get their containing application
// and resort to IProcessDebugManager::GetDefaultApplication if this fails.
HRESULT GetApplication(
[out] IDebugApplication **ppda);

// Gets the application node under which script documents should be added
// can return NULL if script documents should be top-level.
HRESULT GetRootApplicationNode(
[out] IDebugApplicationNode **ppdanRoot);

// Allows a smart host to control the handling of runtime errors
HRESULT OnScriptErrorDebug(
// the runtime error that occurred
[in] IActiveScriptErrorDebug *pErrorDebug,
// whether to pass the error to the debugger to do JIT debugging
[out]BOOL*pfEnterDebugger,
// whether to call IActiveScriptSite::OnScriptError() when the user
// decides to continue without debugging
[out]BOOL *pfCallOnScriptErrorWhenContinuing);
}

```

IActiveScriptErrorDebug

Provides document context information from compile and run time errors.

```

[
object,
uuid(51973C12-CB0C-11d0-B5C9-00A0244A0E7A),
pointer_default(unique)
]
interface IActiveScriptErrorDebug : IActiveScriptError
{
// Provides the document context for the associated error. The character-position range
// should include the entire offending text.
HRESULT GetDocumentContext(
[out] IDebugDocumentContext **ppssc);

```

```
// For runtime errors, provides the stack frame that is in effect.
HRESULT GetStackFrame(
[out] IDebugStackFrame **ppdsf);
}
```

IDebugCodeContext

Abstraction representing a position in executable code as a virtual app counter.

```
[
object,
uuid(51973C13-CB0C-11d0-B5C9-00A0244A0E7A),
pointer_default(unique)
]
interface IDebugCodeContext : IUnknown
{
// Returns the document context associated with this code context.
//
// Note: For text documents, the character-position
// range should include the text for the entire statement. This allows the debugger IDE
// to highlight the current source statement.
HRESULT GetDocumentContext(
[out] IDebugDocumentContext **ppsc);

// Sets or clears a breakpoint at this code context.
HRESULT SetBreakPoint(
[in].BREAKPOINT_STATE bps);
}
```

IDebugExpression

Abstract representation of an asynchronously evaluated expression.

```
[
object,
uuid(51973C14-CB0C-11d0-B5C9-00A0244A0E7A),
pointer_default(unique)
]
interface IDebugExpression : IUnknown
{
// Begins the evaluation of the expression.
HRESULT Start(
// Provides an event driven means for indicating that the expression evaluation
// is complete. If NULL, no events will be fired and the client will need to
```

// poll the expression state using QueryIsComplete.
[in] IDebugExpressionCallback *pdecb);

// Aborts the expression. Evaluation of an expression in progress will be stopped
// at the earliest opportunity. If the expression is actually aborted, GetResultAsString
// will return E_ABORT as phrResult.
HRESULT Abort(void);

// Returns S_FALSE if the operation is still pending.
// Returns S_OK if the operation is complete.
HRESULT QueryIsComplete(void);

// Returns the result of the expression evaluation as a string and an HRESULT. Returns
// E_PENDING if the operation is still pending. Returns S_OK and E_ABORT in phrResult
// when the operation was aborted with Abort.
HRESULT GetResultAsString(
[out] HRESULT *phrResult,
[out] BSTR *pbstrResult);

// Returns the result of the expression evaluation as an
// IDebugProperty and an HRESULT. Returns
// E_PENDING if the operation is still pending. Returns S_OK and E_ABORT in phrResult
// when the operation was aborted with Abort.

HRESULT GetResultAsDebugProperty(
[out] HRESULT *phrResult,
[out] IDebugProperty **ppdp);
}

IDebugExpressionContext

Abstract representation of a context in which expressions can be evaluated.

[
object,
uuid(51973C15-CB0C-11d0-B5C9-00A0244A0E7A),
helpstring("IDebugExpressionContext Interface"),
pointer_default(unique)
]
interface IDebugExpressionContext : IUnknown
{
// Creates an IDebugExpression for the specified text.
HRESULT ParseLanguageText(
// Provides the text of the expression or statement(s).
[in] LPCOLESTR pstrCode,


```

// Radix to use
[in]UINTnRadix,
// See IActiveScriptParse::ParseScriptText
[in]LPCOLESTRpstrDelimiter,
// See above flags.
[in]DWORDdwFlags,
// Returns the IDebugExpression for the given text.
[out] IdebugExpression **ppe
);

```

```

// Returns a name and GUID for the language owning this context
HRESULT GetLanguageInfo (
[out] BSTR*pbstrLanguageName, // the name of the language
[out] GUID*pLanguageID // an unique id for this language
);
}

```

IDebugExpressionCallback

Provides status events related to progress of an IdebugExpression evaluation.

```

[
object,
uuid(51973C16-CB0C-11d0-B5C9-00A0244A0E7A),
pointer_default(unique)
]
interface IDebugExpressionCallBack : IUnknown
{
// Indicates that the expression evaluation is complete. Note that
// IDebugExpression::GetResultAsString can be called from within this event
// handler.
HRESULT onComplete(void);
}

```

IDebugStackFrame

Abstraction representing a logical stack frame on the stack of a thread.

```

[
object,
uuid(51973C17-CB0C-11d0-B5C9-00A0244A0E7A),
pointer_default(unique)
]
interface IDebugStackFrame : IUnknown

```

```
{
// Returns the current code context associated with the stack frame.
HRESULT GetCodeContext(
[out] IdebugCodeContext **ppcc);
// Returns a short or long textual description of the stack frame.
// Normally, when fLong is false, this will provide only the name of the
// function associated with the stack frame. When fLong is true it may
// also provide the parameter(s) to the function or whatever else is
// relevant.
HRESULT GetDescriptionString(
[in] BOOL fLong,
[out] BSTR *pbstrDescription);
// Returns a short or long textual description of the language. When fLong
// is false, just the language name should be provided, eg, "Pascal". When
// fLong is true a full product description may be provided, eg,
// "Gnat Software's Flaming Pascal v3.72".
HRESULT GetLanguageString(
[in] BOOL fLong,
[out] BSTR *pbstrLanguage);
// Returns the thread associated with this stack frame.
HRESULT GetThread(
[out] IdebugApplicationThread **ppat);

// Returns a property browser for the current frame (locals, etc.)
HRESULT GetDebugProperty(
[out] IDebugProperty **ppDebugProp);
}
```

IDebugStackFrameSniffer

Provides a means for enumerating logical stack frames known by a certain component.

```
[
object,
uuid(51973C18-CB0C-11d0-B5C9-00A0244A0E7A),
pointer_default(unique)
]
interface IDebugStackFrameSniffer : IUnknown
{
// Returns an enumerator of stack frames for the current thread. Top of stack should
// be returned first (the most recently pushed frame).
HRESULT EnumStackFrames(
[out] IenumDebugStackFrames **ppedsf);
}
```

IDebugStackFrameSnifferEx

Provides a means for enumerating logical stack frames known by a certain component.

```
[
  object,
  uuid(51973C19-CB0C-11d0-B5C9-00A0244A0E7A),
  pointer_default(unique)
]
interface IdebugStackFrameSnifferEx : IDebugStackFrameSniffer
{
  // Returns an enumerator of stack frames for the current thread.
  // dwSpMin is the minimum address to begin enumerating stack frames
  // Stack frames before this address will be omitted from the enumeration.
  // Top of stack should be returned first (the most recently pushed frame).
  HRESULT EnumStackFramesEx( [in] DWORD dwSpMin, [out] IenumDebugStackFrames
  **ppedsf);
};
```

IDebugSyncOperation

Implemented by a language engine to expose expression evaluation.

```
[
  object,
  uuid(51973C1a-CB0C-11d0-B5C9-00A0244A0E7A),
  pointer_default(unique),
  local
]
interface IDebugSyncOperation : IUnknown
{
  // Get TargetThread is called by PDM to determine what thread
  // to call Evaluate() in
  HRESULT GetTargetThread(
  [out] IdebugApplicationThread **ppatTarget);

  // Execute is called synchronously by the PDM in the target thread. It
  // synchronously performs the operation and returns. It returns E_ABORT if
  // the operation was aborted with InProgressAbort();
  HRESULT Execute(
  [out] IUnknown **ppunkResult);

  // InProgressAbort() is called by the PDM, from within the debugger thread,
```

```

// to cancel an operation which is in progress in another thread. The
// operation should be completed or error out with E_ABORT as soon as
// possible. E_NOTIMPL can be returned if the operation cannot be cancelled.
HRESULT InProgressAbort(void);
}

```

IDebugAsyncOperation

Implemented by the PDM and obtained by the language engine

```

[
  object,
  uuid(51973C1b-CB0C-11d0-B5C9-00A0244A0E7A),
  pointer_default(unique),
  local
]
interface IDebugAsyncOperation : IUnknown
{
  HRESULT GetSyncDebugOperation(
    [out] IDebugSyncOperation **ppsdo);

  // Start() causes the asynchronous operation to begin. It asynchronously
  // causes IDebugSyncOperation::Execute() to be called in the thread obtained
  // from IDebugSyncOperation::GetTargetThread(). It should only
  // be called from within the debugger thread, or it will not return until
  // the operation is complete (it degenerates to synchronous).
  // Returns E_UNEXPECTED if an operation is already pending.
  HRESULT Start(IDebugAsyncOperationCallback *padocb);

  // Abort() causes InProgressAbort() to be called on the IDebugSyncOperation
  // object. It is normally called from within the debugger thread to cancel
  // a hung operation. If the abort happens before the request completes,
  // GetResult() will return E_ABORT. E_NOTIMPL may be returned from this
  // function if the operation is not cancellable.
  HRESULT Abort(void);

  // QueryIsComplete() returns S_OK if the operation is complete; otherwise it
  // returns S_FALSE;
  HRESULT QueryIsComplete(void);

  // If the request is complete, returns the HRESULT and object parameter
  // returned from IDebugSyncOperation::Execute(). Otherwise, returns
  // E_PENDING.
  HRESULT GetResult(
    [out] HRESULT *phrResult,

```

```
[out] IUnknown **ppunkResult);
}
```

IDebugAsyncOperationCallback

Used to signal events from an IdebugAsyncOperation.

```
[
  object,
  uuid(51973C1c-CB0C-11d0-B5C9-00A0244A0E7A),
  pointer_default(unique),
  local
]
interface IDebugAsyncOperationCallback : IUnknown
{
  // onComplete() is fired by the AsyncDebugOperation when a result is available.
  // The event is fired in the debugger thread.
  HRESULT onComplete(void);
}
```

IEnumDebugCodeContexts

Used to enumerate the code contexts corresponding to a document context.

```
[
  object,
  uuid(51973C1d-CB0C-11d0-B5C9-00A0244A0E7A),
  helpstring("IEnumDebugCodeContexts Interface"),
  pointer_default(unique)
]
interface IEnumDebugCodeContexts : IUnknown {
[local]
  HRESULT __stdcall Next(
  [in] ULONG celt,
  [out] IdebugCodeContext **pscc,
  [out] ULONG *pceltFetched);
  HRESULT Skip(
  [in] ULONG celt);
  HRESULT Reset(void);
  HRESULT Clone(
  [out] IenumDebugCodeContexts **ppescc);
}
```

DebugStackFrameDescriptor

Used to enumerate stack frames and merge output from several enumerators (on the same thread). dwMin and dwLim provide a machine dependent representation of the range of physical addresses associated with this stack frame. This is used by the process debug manager to sort the stack frames from multiple script engines.

By convention, stacks grow down and, as such, on architectures where stacks grow up the addresses should be twos-complemented.

The punkFinal is used during enumerator merging. If punkFinal is non-null, It indicates that the current enumerator merging should stop and a new one should be started.

The object indicates how the new enumeration is to be started.

```
typedef struct tagDebugStackFrameDescriptor
{
    IDebugStackFrame *pdsf;
    DWORD dwMin;
    DWORD dwLim;
    BOOL fFinal;
    IUnknown *punkFinal;
} DebugStackFrameDescriptor;
```

IEnumDebugStackFrames

Used to enumerate the stack frames corresponding to a thread.

```
[
    object,
    uuid(51973C1e-CB0C-11d0-B5C9-00A0244A0E7A),
    helpstring("IEnumDebugStackFrames Interface"),
    pointer_default(unique)
]
interface IEnumDebugStackFrames : IUnknown
{
    [local]
    HRESULT __stdcall Next(
        [in] ULONG celt,
        [out] DebugStackFrameDescriptor *prgdsfd,
        [out] ULONG *pceltFetched);
    HRESULT Skip(
        [in] ULONG celt);
    HRESULT Reset(void);
    HRESULT Clone(
        [out] IEnumDebugStackFrames **ppedsf);
}
```

Smart Host Interfaces

Below are the details of the interfaces implemented by a smart host. As mentioned earlier, it is possible to avoid implementing these interfaces by using the smart host helper interfaces.

DebugDocumentInfo

Provides information on a document, which may or may not be instantiated.

```
[
object,
uuid(51973C1f-CB0C-11d0-B5C9-00A0244A0E7A),
helpstring("IDebugDocumentInfo Interface"),
pointer_default(unique)
]
interface IDebugDocumentInfo : IUnknown {
// Returns the specified name for the document. If the indicated name is
// not known, E_FAIL is returned.
HRESULT GetName(
[in] DOCUMENTNAMETYPE dnt,
[out] BSTR *pbstrName);
// Returns a CLSID describing the document type. This allows the debugger IDE
// to host custom viewers for this document. returns CLSID_NULL if this document
// does not have viewable data.
HRESULT GetDocumentClassId(
[out] CLSID *pclsidDocument);
}
```

IDebugDocumentProvider

Provides the means for instantiating a document on demand. This indirect means for instantiating a document:

1. Allows lazy loading of the document.
2. Allows the document object to live at the debugger IDE.
3. Allows more than one way of getting to the identical document object.
This effectively segregates the document from its provider; this allows the provider to carry additional runtime context information.

```
[
  object,
  uuid(51973C20-CB0C-11d0-B5C9-00A0244A0E7A),
  helpstring("IDebugDocumentProvider Interface"),
  pointer_default(unique)
]
interface IDebugDocumentProvider : IDebugDocumentInfo {
// Causes the document to be instantiated if it does not already exist.
HRESULT GetDocument(
[out] IdebugDocument **ppssd);
}
```

IDebugDocument

```
[
  object,
  uuid(51973C21-CB0C-11d0-B5C9-00A0244A0E7A),
  pointer_default(unique)
]
interface IDebugDocument : IDebugDocumentInfo {
}
```

IDebugDocumentText

The interface to a text only debug document.

Conventions:

- 1.Both character positions and line numbers are zero based.
- 2.Character-positions represent character offsets; they do not represent byte or word offsets. For Win32, a character-position is an Unicode offset.

Note: the use of line-number based text management is not recommended; instead it is recommended that character-position based management be used. The line to character-position mapping functions described in this interface may be removed.

```
[
  object,
  uuid(51973C22-CB0C-11d0-B5C9-00A0244A0E7A),
  pointer_default(unique)
]
interface IDebugDocumentText : IDebugDocument {
}
```


// Returns the attributes of the document.

HRESULT GetDocumentAttributes(
[out]TEXT_DOC_ATTR *ptextdocattr);

// Returns the size of the document.

HRESULT GetSize(
[out] ULONG *pcNumLines, // NULL means do not return the number of lines.
[out] ULONG *pcNumChars); // NULL means do not return the number of characters.

// Returns character-position corresponding to the first character of a line.

HRESULT GetPositionOfLine(
[in] ULONG cLineNumber,
[out] ULONG *pcCharacterPosition);

// Returns the line-number and; optionally, the character offset within the line
// that corresponds to the given character-position.

HRESULT GetLineOfPosition(
[in] ULONG cCharacterPosition,
[out] ULONG *pcLineNumber,
[out] ULONG *pcCharacterOffsetInLine); // NULL means do not return a value.

// Retrieves the characters and/or the character attributes associated with
// a character-position range; where a character position range is specified by
// a character-position and a number of characters.

HRESULT GetText(
[in] ULONG cCharacterPosition,
// Specifies a character text buffer. NULL means do not return characters.
[in, out, length_is(*pcNumChars), size_is(cMaxChars)] WCHAR *pcharText,
// Specifies a character attribute buffer. NULL means do not return attributes.
[in, out, length_is(*pcNumChars), size_is(cMaxChars), ptr] SOURCE_TEXT_ATTR
*pstaTextAttr,
// Indicates the actual number of characters/attributes returned. Must be set to zero
// before the call.
[in, out] ULONG *pcNumChars,
// Specifies the number maximum number of character desired.
[in] ULONG cMaxChars);

// Returns the character-position range corresponding to a document context. The
document

// context provided must be associated with this document.

HRESULT GetPositionOfContext(
[in] IDebugDocumentContext *psc,
[out] ULONG *pcCharacterPosition,
[out]ULONG *cNumChars);

// Creates a document context object corresponding to the provided character position range.

```
HRESULT GetContextOfPosition(  
[in] ULONG cCharacterPosition,  
[in] ULONG cNumChars,  
[out] IDebugDocumentContext **ppsc;  
)
```

IDebugDocumentTextEvents

Provides events indicating changes to the associated text document. Note: The text alterations are reflected in the document at the time the events on this interface are fired. Event handlers may retrieve the new text using IDebugDocumentText.

```
[  
object,  
uuid(51973C23-CB0C-11d0-B5C9-00A0244A0E7A),  
pointer_default(unique)  
]  
interface IDebugDocumentTextEvents : IUnknown  
{  
// Indicates that the underlying document has been destroyed and is no longer valid.  
HRESULT onDestroy(void);  
  
// Indicates that new text has been added to the document. Example: progressive loading  
// of HTML.  
//  
HRESULT onInsertText(  
// The position where the new text is inserted.  
[in] ULONG cCharacterPosition,  
// The number of characters that have been inserted.  
[in] ULONG cNumToInsert);  
  
// Indicates that text has been removed from the document.  
HRESULT onRemoveText(  
// The character-position of the first character removed.  
[in] ULONG cCharacterPosition,  
// The number of characters removed.  
[in] ULONG cNumToRemove);  
  
// Indicates that text has been replaced.  
HRESULT onReplaceText(  
// The starting character-position of the character-position range  
// that is being replaced.  
[in] ULONG cCharacterPosition,
```

// The number of characters replaced.
[in] ULONG cNumToReplace);

// Indicates that the text attributes associated with the underlying character-position
// range has changed.
HRESULT onUpdateTextAttributes(
// The character-position of the first character whose attributes have changed.
[in] ULONG cCharacterPosition,
// The number of characters in the range.
[in] ULONG cNumToUpdate);

// Indicates that the document attributes have changed.
HRESULT onUpdateDocumentAttributes(
// The new document attributes.
[in] TEXT_DOC_ATTR textdocattr);
}

IDebugDocumentHelper

IDebugDocumentHelper greatly simplifies the task of creating a smart host for ActiveDebugging. IDebugDocumentHelper automatically provides implementations for IDebugDocumentProvider, IDebugDocument, IDebugDocumentText, IDebugDocumentContext, IDebugDocumentTextEvents, and many of the other interfaces necessary for smart hosting. To be a smart host using IDebugDocumentHelper, a host application only to do only three two things:

- (1) CoCreate an IProcessDebugManager and use it to add your application to the list of debuggable applications.
- (2) create an IDebugDocumentHelper for each host document and make the appropriate calls to define the document name, parent document, text, and script blocks.
- (3) Implement IActiveScriptSiteDebug on your IActiveScriptSite object (implemented already for Active Scripting. The only non-trivial method on IActiveScriptSiteDebug simply delegates to the helper.

Additionally, the host can optionally implement IDebugDocumentHost if it needs additional control over syntax color, document context creation, and other extended functionality. The main limitation on the smart host helper is that can only handle documents whose contents change or shrink after they have been added. For many smart hosts, however, the functionality it provides is exactly what is needed. Below we go into each of the steps in more detail.

Create an Application Object

Before the smart host helper can be used, it is necessary to create an IDebugApplication object to represent your application in the debugger. The steps for creating an application object are as follows:

- (1) Create an instance of the process debug manager using CoCreateInstance.
 - (2) Call IProcessDebugManager::CreateApplication().
 - (3) Set the name on the application using SetName().
 - (4) Add the application object to the list of debuggable applications using AddApplication().
- Below is code to do this, minus error-check and other niceties.

```
CoCreateInstance(CLSID_ProcessDebugManager, NULL, CLSCTX_INPROC_SERVER |
CLSCTX_INPROC_HANDLER | CLSCTX_LOCAL_SERVER,
IID_IProcessDebugManager, (void **)&g_ppdm);
g_ppdm->CreateApplication(&g_pda);
g_pda->SetName(L"My cool application");
g_ppdm->AddApplication(g_pda, &g_dwAppCookie);
```

Using IDebugDocumentHelper

The minimal sequence of steps for using the helper is as follows:

- (1) For each host document, create a helper using IprocessDebugManager :: CreateDebugDocumentHelper.
- (2) Call Init on the helper, giving the name, document attributes, etc.
- (3) Call Attach with parent helper for the document (or NULL if the document is the root) to define the position of the document in the tree and make it visible to the debugger
- (4) Call AddDBCSText() or AddUnicodeText() to define the text of the document. These can be called multiple times if document is downloaded incrementally, as in the case of a browser.
- (5) Call DefineScriptBlock to define the ranges for each script block and the associated script engines.

Implementing IActiveScriptSiteDebug

To implement *GetDocumentContextFromPosition*, get the helper corresponding to the given site, then get the starting document offset for the given source context, as follows:

```
pddh->GetScriptBlockInfo(dwSourceContext, NULL, &ulStartPos, NULL);
Next, use the helper to create a new document context for the given character offset:
pddh->CreateDebugDocumentContext(ulStartPos + uCharacterOffset, cChars,
&pddcNew);
```

To implement *GetRootApplicationNode*, simply call IDebugApplication::GetRootNode. To implement *GetDebugApplication*, simply return the IDebugApplication you initially created using the process debug manager.

The optional IDebugDocumentHost interface

The host can provide an implementation of IDebugDocumentHost using IDebugDocumentHelper::SetHost that gives it additional control over the helper. Here are some of the key things the host interface allows you to do:

- (1) Add text using AddDeferredText so that the host doesn't have to provide the actual characters immediately. When the characters are really needed, the helper will call IDebugDocumentHost::GetDeferredCharacters on the host.
- (2) Override the default syntax coloring provided by the helper. The helper will call IDebugDocumentHost::GetScriptTextAttributes when it needs to know the coloring for a range of characters, falling back on its default implementation if the host return E_NOTIMPL.
- (3) Providing a controlling unknown for document contexts created by the helper by implementing IDebugDocumentHost::OnCreateDocumentContext. This allows the host to override the functionality of the default document context implementation.
- (4) Provide a path name in the file system for the document. Some debugging UIs will use this to permit the user to edit and save changes to the document. IDebugDocumentHost::NotifyChanged will be called to notify the host after the document has been saved.

```
[
  object,
  uuid(51973C26-CB0C-11d0-B5C9-00A0244A0E7A),
  helpstring("IDebugDocumentHelper Interface"),
  pointer_default(unique)
]
interface IDebugDocumentHelper : IUnknown
{
  // Initialize a debug doc helper with the given name and
  // initial attributes.
  //
  // Note: The document will not actually appear in the tree
  // until Attach is called.
  HRESULT Init(
    [in] IDebugApplication *pda,
    [in, string]LPCOLESTR pszShortName,
    [in, string]LPCOLESTR pszLongName,
    [in]TEXT_DOC_ATTR docAttr
  );

  // Add the document to the doc tree, using pddhParent as the parent.
  // If the pddhParent is NULL, the document will be top-level.
  HRESULT Attach([in] IdebugDocumentHelper *pddhParent);

  // Remove the document from the doc tree.
  HRESULT Detach();

  // Add the given set of unicode characters to end of the document to generate
  // IDebugDocumentTextEvent notifications.
```

// If this method is called after AddDeferredText has been called,
// E_FAIL will be returned.

HRESULT AddUnicodeText(
[in, string] LPCOLESTR pszText
);

// Add the given set of DBCS characters to end of the document.
// (This will generate IDebugDocumentTextEvent notifications.)

// If this method is called after AddDeferredText has been called,
// E_FAIL will be returned.

HRESULT AddDBCSText(
[in, string] LPCSTR pszText
);

// Set the DebugDocumentHost interface.

// If provided, this interface will be used for

// smart-host syntax coloring, fetching deferred text, and returning

// controlling unknowns for newly created document contexts.

HRESULT SetDebugDocumentHost(
[in] IdebugDocumentHost * pddh
);

// Notify the helper that the given text is available, but don't actually provide the characters

// This allows the host to defer providing the characters unless they are actually needed,

// while still allowing the helper to generate accurate notifications and size information.

// dwTextStartCookie is a cookie, defined by the host, that represents the starting

// position of the text. For example, in a host that represents text in DBCS, the cookie

// could be a byte offset. This cookie will be provided in subsequent calls to GetText.

// NB: It is assumed that a single call to GetText can get characters from multiple calls

// to AddDeferredText. The helper classes may also ask for the same range of deferred

// characters more than once. It is an error to mix calls to AddDeferredText with calls to

// AddUnicodeText or AddDBCSText-- Doing so will cause E_FAIL to be returned.

HRESULT AddDeferredText(
[in] ULONG cChars, // number of (Unicode) characters to add
[in] DWORD dwTextStartCookie

// host-defined cookie representing the starting position of the text.

);

// Notify the helper that a particular range of characters is a script block handled by

// the given script engine. All syntax coloring and code context lookups for that

// range will be delegated to that script engine. This method would be used by a smart

// host whose documents contained embedded script blocks, or by a language

// engine containing embedded scripts for other languages. DefineScriptBlock should

// be called *after* the text has been added (via AddDBCSText, etc) but before the

// script script block has been parsed (via IActiveScriptParse).

HRESULT DefineScriptBlock(

```

[in] ULONG ulCharOffset,
[in] ULONG cChars,
[in] IActiveScript* pas,
[in] BOOL fScriptlet,
[out] DWORD* pdwSourceContext
);

```

```

// Set the default attribute to use for text that is not in a script block. If not explicitly
// set, the default attributes for text outside of a script block is
// OURCETEXT_ATTR_NONSOURCE. This would allow, for example, for text
// outside of script blocks to be colored grey and marked read-only.
HRESULT SetDefaultTextAttr(SOURCE_TEXT_ATTR staTextAttr);

```

```

// Explicitly set the attributes on a range of text, overriding any other attributes
// on that text. It is an error to set the attributes on a text range that has not
// yet been added using AddText.
HRESULT SetTextAttributes(
[in] ULONG ulCharOffset,
[in] ULONG cChars,
[in, length_is(cChars), size_is(cChars)]
SOURCE_TEXT_ATTR* pstaTextAttr);

```

```

// Set a new long name for the document
HRESULT SetLongName(
[in, string] LPCOLESTR pszLongName);

```

```

// Set a new short name for the document
HRESULT SetShortName(
[in, string] LPCOLESTR pszShortName);

```

```

// Define a new set of document attributes
HRESULT SetDocumentAttr(
[in] TEXT_DOC_ATTR pszAttributes
);

```

```

// Return the debug application node corresponding to this document
HRESULT GetDebugApplicationNode(
[out] IdebugApplicationNode **ppdan);

```

```

// Once a script block has been defined, this method allows the
// associate range and script engine to be retrieved.
HRESULT GetScriptBlockInfo(
[in] DWORD dwSourceContext,
[out] IActiveScript** ppasd,
[out] ULONG *piCharPos,
[out] ULONG *pcChars);

```

// Allows the host to create a new debug document context

HRESULT CreateDebugDocumentContext(

[in]ULONG iCharPos,

[in]ULONG cChars,

[out] IdebugDocumentContext ** ppddc);

// Bring this document to the top in the debugger UI.

// If the debugger isn't started already, start it now.

HRESULT BringDocumentToTop();

// Bring the given context in this document to the top in the debugger UI.

HRESULT BringDocumentContextToTop (IDebugDocumentContext *pddc);

};

IDebugDocumentHost

The interface from the IdebugDocumentHelper back to the smart host or language engine. This interface exposes host specific functionality such as syntax coloring.

[
object,
uuid(51973C27-CB0C-11d0-B5C9-00A0244A0E7A),
helpstring("IDebugDocumentHost Interface"),
pointer_default(unique)
]

interface IDebugDocumentHost : IUnknown

{

// Return a particular range of characters in the original host document,
// added using AddDeferredText.

//

// It is acceptable for a host to return E_NOTIMPL for this method,
// as long as the host doesn't call AddDeferredText.

//

// (Note that this is text from the _original_ document. The host
// does not need to be responsible for keeping track of edits, etc.)

HRESULT GetDeferredText(

[in] DWORD dwTextStartCookie,

// Specifies a character text buffer. NULL means do not return characters.

[in, out, length_is(*pcNumChars), size_is(cMaxChars)] WCHAR *pcharText,

// Specifies a character attribute buffer. NULL means do not return attributes.

[in, out, length_is(*pcNumChars), size_is(cMaxChars)] SOURCE_TEXT_ATTR
*pstaTextAttr,

// Indicates the actual number of characters/attributes returned. Must be set to zero


```
// before the call.
[in, out] ULONG *pcNumChars,
// Specifies the number maximum number of character desired.
[in] ULONG cMaxChars);

// Return the text attributes for an arbitrary block of document text.
// It is acceptable for hosts to return E_NOTIMPL, in which case the
// default attributes are used.
HRESULT GetScriptTextAttributes(
// The script block text. This string need not be null terminated.
[in, size_is(uNumCodeChars)]LPCOLESTRpstrCode,
// The number of characters in the script block text.
[in]ULONGuNumCodeChars,
// See IActiveScriptParse::ParseScriptText for a description of this argument.
[in]LPCOLESTRpstrDelimiter,
// See IActiveScriptParse::ParseScriptText for a description of this argument.
[in]DWORDddwFlags,
// Buffer to contain the returned attributes.
[in, out, size_is(uNumCodeChars)]SOURCE_TEXT_ATTR *pattr);

// Notify the host that a new document context is being created and allow the host
// to optionally return a controlling unknown for the new context.
//
// This allows the host to add new functionality to the helper-provided document
// contexts. It is acceptable for the host to return E_NOTIMPL or a null outer
// unknown for this method, in which case the context is used "as is".
HRESULT OnCreateDocumentContext(
[out] IUnknown** ppunkOuter);

// Return the full path (including file name) to the document's source file.
// *pflsOriginalPath is TRUE if the path refers to the original file for the document.
// *pflsOriginalPath is FALSE if the path refers to a newly created temporary file
// Returns E_FAIL if no source file can be created/determined.
HRESULT GetPathName(
[out] BSTR *pbstrLongName,
[out] BOOL *pflsOriginalFile);

// Return just the name of the document, with no path information.
// (Used for "Save As...")
HRESULT GetFileName(
[out] BSTR *pbstrShortName);

// Notify the host that the document's source file has been saved and
// that its contents should be refreshed.
HRESULT NotifyChanged();
};
```

IDebugDocumentContext

```
[
object,
uuid(51973C28-CB0C-11d0-B5C9-00A0244A0E7A),
pointer_default(unique)
]
interface IDebugDocumentContext : IUnknown
{
// Returns the document that contains this context.
HRESULT GetDocument(
[out] IDebugDocument **ppsd);

// Enumerates the code contexts associated with this document context. Generally
// there will only be one code context but there are important exceptions, such as
// include file or templates (in C++).
HRESULT EnumCodeContexts(
[out] IEnumDebugCodeContexts **ppescc);
}
```

Debugger UI interfaces

Below are the interfaces that allow other components to launch and interface with the debugger UI.

IDebugSessionProvider

The primary interface provided by a debugger IDE to enable host and language initiated debugging. Its sole purpose is to establish a debug session for a running application.

```
cpp_quote( "EXTERN_C const CLSID CLSID_DefaultDebugSessionProvider;")
[
object,
uuid(51973C29-CB0C-11d0-B5C9-00A0244A0E7A),
helpstring("IDebugSessionProvider Interface"),
pointer_default(unique)
]
interface IDebugSessionProvider : IUnknown
{
// Initiates a debug session with the specified application. The debugger should
// call IRemoteDebugApplication::ConnectDebugger before returning from this call.
HRESULT StartDebugSession(
[in] IremoteDebugApplication *pda);
}
```

};

IApplicationDebugger

This is the primary interface exposed by a debugger IDE.

```
[
object,
uuid(51973C2a-CB0C-11d0-B5C9-00A0244A0E7A),
helpstring("IApplicationDebugger Interface"),
pointer_default(unique)
]
interface IApplicationDebugger : IUnknown
{
// Indicates if the debugger is alive. Should always return S_OK. If the debugger
// has rudely shut down COM will return an error from the marshalling proxy.
HRESULT QueryAlive(void);
// Provides a mechanism for hosts and language engines running out-of-process to the
// debugger to create objects in the debugger process. This can be used for any purpose,
// including extending the debugger UI. This method simply delegates to
CoCreateInstance.
HRESULT CreateInstanceAtDebugger(
[in]REFCLSID rclsid,// Class identifier (CLSID) of the object
[in]IUnknown *pUnkOuter,// Object is or isn't part of an aggregate
[in]DWORD dwClsContext,// Context for running executable code
[in]REFIID riid,// Interface identifier
[out, iid_is(riid)]IUnknown **ppvObject);
// Points to requested interface pointer. This method is called when IdebugApplication ::
// DebugOutput is called. The debugger can use this to display the string in an output
// window.
HRESULT onDebugOutput(
[in] LPCOLESTR pstr);
// This method is called when a breakpoint is hit. The application will remain
// suspended until the debugger IDE calls IDebugApplication::ResumeFromBreakPoint.
HRESULT onHandleBreakPoint(
// Indicates the thread in which the breakpoint occurred.
[in] IremoteDebugApplicationThread *prpt,
// Indicates the reason for the breakpoint.
[in]BREAKREASON br,
// optional runtime error info (for when br == BREAKREASON_ERROR)
[in] IactiveScriptErrorDebug *pError);

// This method is called when IDebugApplication::Close is called.
HRESULT onClose(void);
```

```
// Handle a custom event.
// The semantics of the GUID and IUnknown are entirely application/debugger defined
// This method may return E_NOTIMPL.
HRESULT onDebuggerEvent(
[in]REFIID riid,
[in]IUnknown *punk);
};
```

IApplicationDebuggerUI

This is a secondary interface exposed by some debugger IDE that allows an external component to have additional control over the debuggers UI.

```
[
object,
uuid(51973C2b-CB0C-11d0-B5C9-00A0244A0E7A),
helpstring("IApplicationDebuggerUI Interface"),
pointer_default(unique)
]
interface IApplicationDebuggerUI : IUnknown
{
// Bring the window corresponding to the given debug document to the front.
// Returns E_INVALIDARG if the document is not known.
HRESULT BringDocumentToTop([in] IdebugDocumentText * pddt);

// Bring the window containing the given doc context to the front,
// and scroll it to the correct location.
// Returns E_INVALIDARG if the context is not known.
HRESULT BringDocumentContextToTop([in] IdebugDocumentContext * pddc);
};
```

IMachineDebuggerManager

The primary interface to the Machine Debug Manager.

```
cpp_quote( "EXTERN_C const CLSID CLSID_MachineDebuggerManager;")
[
object,
uuid(51973C2c-CB0C-11d0-B5C9-00A0244A0E7A),
helpstring("IMachineDebuggerManager Interface"),
pointer_default(unique)
]
interface IMachineDebuggerManager : IUnknown
```

```
{
// Adds an application to the running application list. This method is called by the
// process debug manager whenever IProcessDebugManager::AddApplication is called.
HRESULT AddApplication(
[in] IRemoteDebugApplication *pda,
[out] DWORD *pdwAppCookie);
// Removes an application from the running application list. This method is called by the
// process debug manager whenever IProcessDebugManager::RemoveApplication is
// called.
HRESULT RemoveApplication(
[in] DWORD dwAppCookie);
// Returns an enumerator of the current list of running applications. Used by the debugger
// IDE to display and attach applications for debugging purposes.
HRESULT EnumApplications(
[out] IEnumRemoteDebugApplications **ppeda);
};
```

IMachineDebugManagerCookie

```
[
object,
uuid(51973C2d-CB0C-11d0-B5C9-00A0244A0E7A),
helpstring("IMachineDebugManagerCookie Interface"),
pointer_default(unique)
]
interface IMachineDebugManagerCookie : IUnknown
{
// Adds an application to the running application list. This method is called by the
// process debug manager whenever IProcessDebugManager::AddApplication is called.
HRESULT AddApplication(
[in] IRemoteDebugApplication *pda,
[in] DWORD dwDebugAppCookie,
[out] DWORD *pdwAppCookie);
// Removes an application from the running application list. This method is called by the
// process debug manager whenever IProcessDebugManager::RemoveApplication is
// called.
HRESULT RemoveApplication(
[in] DWORD dwDebugAppCookie,
[in] DWORD dwAppCookie);
// Returns an enumerator of the current list of running applications. Used by the debugger
// IDE to display and attach applications for debugging purposes.
HRESULT EnumApplications(
[out] IEnumRemoteDebugApplications **ppeda);
};
```

IMachineDebugManagerEvents

This event interface is used to signal changes in the running application list maintained by the machine debug manager. It can be used by the debugger IDE to display a dynamic list of applications.

```
[
  object,
  uuid(51973C2e-CB0C-11d0-B5C9-00A0244A0E7A),
  helpstring("IMachineDebugManagerEvents Interface"),
  pointer_default(unique)
]
interface IMachineDebugManagerEvents : IUnknown
{
  // Indicates that a new application has appeared on the running application list.
  HRESULT onAddApplication(
    [in] IRemoteDebugApplication *pda,
    [in] DWORD dwAppCookie);
  // Indicates that an application has been removed from the running application list.
  HRESULT onRemoveApplication(
    [in] IRemoteDebugApplication *pda,
    [in] DWORD dwAppCookie);
};
```

Process Debug Manager Interfaces

IProcessDebugManager

The primary interface to the process debug manager.

```
cpp_quote( "EXTERN_C const CLSID CLSID_ProcessDebugManager;")
[
  object,
  uuid(51973C2f-CB0C-11d0-B5C9-00A0244A0E7A),
  helpstring("IProcessDebugManager Interface"),
  pointer_default(unique),
  local
]
interface IProcessDebugManager : IUnknown
{
  // Creates a new debug application object. The new object is not added to the
  // running application list and has no name.
  HRESULT CreateApplication(
```

```
[out] IDebugApplication **ppda);
// Returns a default application object for the current process, creating one and adding
// it to the running application list if necessary. Language engines should use this
// application if they are running on a host that does not provide an application.
HRESULT GetDefaultApplication(
[out] IDebugApplication **ppda);
// Adds an application to the running application list in the machine debug manager.
HRESULT AddApplication(
[in] IDebugApplication *pda,
// Returns a cookie used to remove the application from the machine debug manager.
[out] DWORD *pdwAppCookie);
// Removes an application from the running application list.
HRESULT RemoveApplication(
// The cookie provided by AddApplication.
[in] DWORD dwAppCookie);

HRESULT CreateDebugDocumentHelper(
[in] IUnknown *punkOuter,
[out] IdebugDocumentHelper ** pddh);
};
```

IRemoteDebugApplication

An abstraction representing a running application. It need not correspond to an OS process. Applications are the smallest debuggable unit; that is, the debugger IDE normally targets an application for debugging.

The application object is normally implemented by the Process Debug Manager.

```
[
object,
uuid(51973C30-CB0C-11d0-B5C9-00A0244A0E7A),
helpstring("IRemoteDebugApplication Interface"),
pointer_default(unique)
]
interface IRemoteDebugApplication : IUnknown
{
// Continue an application which is currently in a breakpoint.
HRESULT ResumeFromBreakPoint(
// For stepping modes, the thread which is to be affected by the stepping mode.
[in] IremoteDebugApplicationThread *prptFocus,
// The action to take (step mode, etc.) upon resuming the application
[in] BREAKRESUMEACTION bra,
// the action to take in the case that we stopped because of an error
[in] ERRORRESUMEACTION era);
```

```
// Causes the application to break into the debugger at the earliest opportunity. Note
// that a long time may elapse before the application actually breaks, particularly if
// the application is not currently executing script code.
HRESULT CauseBreak(void);
// Connects a debugger to the application. Only one debugger may be connected at a
// time; this method fails if there is already a debugger connected
HRESULT ConnectDebugger(
[in] IApplicationDebugger *pad);
// Disconnects the current debugger from the application.
HRESULT DisconnectDebugger(void);
// Returns the current debugger connected to the application.
HRESULT GetDebugger(
[out] IApplicationDebugger **pad);
// Provides a mechanism for the debugger IDE, running out-of-process to the
// application, to create objects in the application process.
// This method simply delegates to CoCreateInstance.
HRESULT CreateInstanceAtApplication(
[in] REFCLSID rclsid, // Class identifier (CLSID) of the object
// Note: This parameter may have to be removed.
[in] IUnknown *pUnkOuter, // Object is or isn't part of an aggregate
[in] DWORD dwClsContext, // Context for running executable code
[in] REFIID riid, // Interface identifier
[out, iid_is(riid)] IUnknown **ppvObject);
// Points to requested interface pointer
// Indicates if the application is alive. Should always return S_OK. If the application
// process has rudely shut down COM will return an error from the marshalling proxy.
HRESULT QueryAlive(void);
// Enumerates all threads known to be associated with the application.
// New threads may be added at any time.
HRESULT EnumThreads(
[out] IEnumRemoteDebugApplicationThreads **pperdat);
// Returns the application node under which all nodes associated with the
// application are added.
HRESULT GetName(
[out] BSTR *pbstrName);
// Returns a node for the application
HRESULT GetRootNode(
[out] IDebugApplicationNode **ppdanRoot);
// Returns an enumerator that lists the global expression
// contexts for all languages running in this application
HRESULT EnumGlobalExpressionContexts (
[out] IEnumDebugExpressionContexts **ppedec);
};
```


IDebugApplication

This interface is an extension of `IRemoteDebugApplication`, exposing non-remotable methods for use by language engines and hosts.

```
[
  object,
  uuid(51973C32-CB0C-11d0-B5C9-00A0244A0E7A),
  helpstring("IDebugApplication Interface"),
  pointer_default(unique),
  local
]
interface IDebugApplication : IRemoteDebugApplication
{
  // Sets the name of the application that is returned in subsequent calls
  // to IRemoteDebugApplication::GetName.
  HRESULT SetName(
    [in]LPCOLESTR pstrName);
  // This method is called by language engines, in single step mode, just before they
  // return to their caller. The process debug manager uses this opportunity to notify all
  // other script engines that they should break at the first opportunity. This is how
  // cross language step modes are implemented.
  HRESULT StepOutComplete(void);
  // Causes the given string to be displayed by the debugger IDE, normally in an output
  // window. This mechanism provides the means for a language engine to implement
  // language
  // specific debugging output support. Example: Debug.WriteLine("Help") in JavaScript.
  HRESULT DebugOutput(
    [in]LPCOLESTR pstr);
  // Causes a default debugger IDE to be started and a debug session to be attached to
  // this application if one does not already exist. This is used to implement just-in-time
  // debugging.
  HRESULT StartDebugSession(void);
  // Called by the language engine in the context of a thread that has hit a breakpoint.
  // This method causes the current thread to block and a notification of the breakpoint
  // to be sent to the debugger IDE. When the debugger IDE resumes the application this
  // method returns with the action to be taken.
  //
  // Note: While in the breakpoint the language engine may be called in this thread to do
  // various things such as enumerating stack frames or evaluating expressions.
  HRESULT HandleBreakPoint(
    [in]BREAKREASON br,
    [out]BREAKRESUMEACTION *pbra);
  // Causes this application to release all references and enter a zombie state. Called
  // by the owner of the application generally on shut down.
  HRESULT Close(void);
}
```

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```

// Returns the current break flags for the application.
HRESULT GetBreakFlags(
[out] APPBREAKFLAGS *pabf,
[out] IremoteDebugApplicationThread **pprdatSteppingThread);
// Returns the application thread object associated with the currently running thread.
HRESULT GetCurrentThread(
[out] IdebugApplicationThread **pat);
// Creates an IDebugAsyncOperation object to wrap a provided IdebugSyncOperation
// object. This provides a mechanism for language engines to implement asynchronous
// expression and evaluation, etc. without having to know the details of
// synchronization with the debugger thread. See the descriptions for
// IDebugSyncOperation and IdebugAsyncOperation for more details.
HRESULT CreateAsyncDebugOperation(
[in] IdebugSyncOperation *psdo,
[out] IdebugAsyncOperation **ppado);
// Adds a stack frame sniffer to this application. Generally called by a language engine
// to expose its stack frames to the debugger. It is possible for other entities to
// expose stack frames.
HRESULT AddStackFrameSniffer(
[in] IdebugStackFrameSniffer *pdsfs,
// Returns a cookie that is used to remove this stack frame sniffer
// from the application.
[out] DWORD *pdwCookie);
// Removes a stack frame sniffer from this application.
HRESULT RemoveStackFrameSniffer(
// The cookie returned by AddStackFrameSniffer.
[in] DWORD dwCookie);
// Returns S_OK if the current running thread is the debugger thread.
// Otherwise, returns S_FALSE.
HRESULT QueryCurrentThreadIsDebuggerThread(void);
// Provides a mechanism for the caller to run code in the debugger thread. This is
// generally used so that language engines and hosts can implement free threaded
// objects on top of their single threaded implementations.
HRESULT SynchronousCallInDebuggerThread(
[in] IdebugThreadCall *pptc,
[in] DWORD dwParam1,
[in] DWORD dwParam2,
[in] DWORD dwParam3);
// Creates a new application node which is associated with a specific
// document provider. Before it is visible, the new node must be
// attached to a parent node.
HRESULT CreateApplicationNode(
[out] IdebugApplicationNode **ppdanNew);

// Fire a generic event to the IApplicationDebugger (if any)
// The semantics of the GUID and IUnknown are entirely application/debugger defined

```

// This method is currently unimplemented but is here to allow for future extensions.

```
HRESULT FireDebuggerEvent(
[in]REFGUID riid,
[in]IUnknown *punk);
```

// Called by the language engine in the context of a thread that has caused a runtime error. This method causes the current thread to block and a notification of the error to be sent to the debugger IDE. When the debugger IDE resumes the application this method returns with the action to be taken.

// Note: While in the runtime error the language engine may be called in this thread to do various things such as enumerating stack frames or evaluating expressions.

```
HRESULT HandleRuntimeError(
[in] IActiveScriptErrorDebug *pErrorDebug, // the error that occurred
[in] IActiveScriptSite *pScriptSite, // the script site of the thread
[out] BREAKRESUMEACTION *pbra, // how to continue execution (stepping etc...)
[out] ERRORRESUMEACTION *perra, // how to handle the error case
[out] BOOL *pfCallOnScriptError); // if TRUE then engine should call
IActiveScriptSite::OnScriptError()
```

// return TRUE if there is a JIT debugger registered
 BOOL FCanJitDebug ();

// returns TRUE if a JIT debugger is registered to auto-JIT debug dumb hosts
 BOOL FIsAutoJitDebugEnabled ();

// Adds a global expression context provider to this application
 HRESULT AddGlobalExpressionContextProvider(
[in] IprovideExpressionContexts *pdsfs,
// Returns a cookie that is used to remove this global expression context provider
// from the application.
[out] DWORD *pdwCookie);

// Removes a global expression context provider from this application.
 HRESULT RemoveGlobalExpressionContextProvider(
// The cookie returned by AddGlobalExpressionContextProvider.
[in] DWORD dwCookie);
};

IRemoteDebugApplicationEvents:

This is the event interface supplied by a debug application: It is always called from within the debugger thread.

[
 object,

```

uuid(51973C33-CB0C-11d0-B5C9-00A0244A0E7A),
helpstring("IRemoteDebugApplicationEvents Interface"),
pointer_default(unique)
]
interface IRemoteDebugApplicationEvents : IUnknown
{
    HRESULT OnConnectDebugger(
        [in] IapplicationDebugger *pad);
    HRESULT OnDisconnectDebugger(void);
    HRESULT OnSetName(
        [in] LPCOLESTR pstrName);
    HRESULT OnDebugOutput(
        [in] LPCOLESTR pstr);
    HRESULT OnClose(void);
    HRESULT OnEnterBreakPoint(
        [in] IremoteDebugApplicationThread *prdat);
    HRESULT OnLeaveBreakPoint(
        [in] IremoteDebugApplicationThread *prdat);
    HRESULT OnCreateThread(
        [in] IremoteDebugApplicationThread *prdat);
    HRESULT OnDestroyThread(
        [in] IremoteDebugApplicationThread *prdat);
    HRESULT OnBreakFlagChange(
        [in] APPBREAKFLAGS abf,
        [in] IremoteDebugApplicationThread *prdatSteppingThread);
};

```

IDebugApplicationNode

Provides the functionality of IdebugDocumentProvider, plus a context within a project tree.

```

[
    object,
    uuid(51973C34-CB0C-11d0-B5C9-00A0244A0E7A),
    pointer_default(unique)
]
interface IDebugApplicationNode : IdebugDocumentProvider {
    HRESULT EnumChildren(
        [out] IenumDebugApplicationNodes **pperddp);
    HRESULT GetParent(
        [out] IdebugApplicationNode **pprddp);
    HRESULT SetDocumentProvider(
        [in] IdebugDocumentProvider *pddp);
    HRESULT Close(void);
    HRESULT Attach(

```

```
[in] IdebugApplicationNode *pdanParent);
HRESULT Detach(void);
}
```

IDebugApplicationNodeEvents

Event interface for DebugApplicationNode object.

```
[
object,
uuid(51973C35-CB0C-11d0-B5C9-00A0244A0E7A),
pointer_default(unique)
]
interface IDebugApplicationNodeEvents : IUnknown {
HRESULT onAddChild(
[in] IdebugApplicationNode *prddpChild);
HRESULT onRemoveChild(
[in] IdebugApplicationNode *prddpChild);
HRESULT onDetach(void);
HRESULT onAttach(
[in] IdebugApplicationNode *prddpParent);
}
```

IDebugThreadCall

IDebugThreadCall is implemented by a component making a cross-thread call using the IDebugThread marshalling implementation in the PDM. It is called by the PDM in the desired thread and should dispatches the call to the desired implementation, casting the parameter information passed in the dwParam's to the appropriate top. It is, of course, a free-threaded object.

```
[
object,
uuid(51973C36-CB0C-11d0-B5C9-00A0244A0E7A),
pointer_default(unique),
local
]
interface IDebugThreadCall : IUnknown
{
HRESULT ThreadCallHandler(
[in] DWORD dwParam1,
[in] DWORD dwParam2,
[in] DWORD dwParam3);
}
```

IRemoteDebugApplicationThread

An abstraction representing a thread of execution within a particular application.

```
[
    object,
    uuid(51973C37-CB0C-11d0-B5C9-00A0244A0E7A),
    pointer_default(unique)
]
interface IRemoteDebugApplicationThread : IUnknown
{
    // Returns an operating system dependent identifier associated with the thread.
    //
    // Note: The returned value does not need to be unique across machines.
    HRESULT GetSystemThreadId(
        [out]DWORD *dwThreadId);
    // Returns the application object associated with the thread.
    HRESULT GetApplication(
        [out] IremoteDebugApplication **pprda);
    // Returns an enumerator for the stack frames associated with the thread. Can only
    // be called when in a breakpoint. The stack frame enumerator enumerates stack frames
    // in the most recently called order.
    HRESULT EnumStackFrames(
        [out] IenumDebugStackFrames **ppedsf);

    HRESULT GetDescription(
        [out]BSTR *pbstrDescription,
        [out]BSTR *pbstrState);

    // Forces execution to continue as close as possible to the
    // given code context, in the context of the given frame.
    // Either of these arguments may be NULL, representing the
    // current frame or context.
    HRESULT SetNextStatement (
        [in] IdebugStackFrame *pStackFrame,
        [in] IdebugCodeContext *pCodeContext);

    // Thread State flags
    typedef DWORD THREAD_STATE;
    const THREAD_STATE THREAD_STATE_RUNNING=0x00000001;
    const THREAD_STATE THREAD_STATE_SUSPENDED=0x00000002;
    const THREAD_STATE THREAD_STATE_BLOCKED=0x00000004;
    const THREAD_STATE THREAD_STATE_OUT_OF_CONTEXT=0x00000008;
```

```
// returns the current state of the thread
HRESULT GetState (
[out] DWORD *pState);

// suspends the thread (increments the suspend count)
HRESULT Suspend (
[out] DWORD *pdwCount);

// resumes the thread (decrements the suspend count)
HRESULT Resume (
[out] DWORD *pdwCount);

// returns the current suspend count of the thread
HRESULT GetSuspendCount (
[out] DWORD *pdwCount);
}
```

IDebugApplicationThread

An extension of IRemoteDebugApplicationThread that provides non-remotable access to the thread. This interface is used by language engines and hosts to provide thread synchronization and to maintain thread specific debug state information.

```
[
object,
uuid(51973C38-CB0C-11d0-B5C9-00A0244A0E7A),
pointer_default(unique),
local
]
interface IDebugApplicationThread : IremoteDebugApplicationThread
{
// Provides a mechanism for the caller to run code in another thread. This is generally
// used so that language engines and hosts can implement free threaded objects on top
// of their single threaded implementations.
HRESULT SynchronousCallIntoThread(
// The interface to be called back in the target thread.
[in] IdebugThreadCall *pstcb,
// Three arguments passed to the IDebugThreadCall.
[in]DWORD dwParam1,
[in]DWORD dwParam2,
[in]DWORD dwParam3);
// Returns S_OK when this is the currently running thread else S_FALSE is returned.
HRESULT QueryIsCurrentThread(void);
// Returns S_OK when this is the debugger thread. Otherwise, returns S_FALSE.
HRESULT QueryIsDebuggerThread(void);
}
```

```

HRESULT SetDescription(
[in]LPCOLESTR pstrDescription);
HRESULT SetStateString(
[in]LPCOLESTR pstrState);
}

```

```

[
object, local,
uuid(51973C39-CB0C-11d0-B5C9-00A0244A0E7A),
helpstring("IDebugCookie Interface"),
pointer_default(unique)
]
interface IDebugCookie : IUnknown
{
HRESULT SetDebugCookie([in]DWORD dwDebugAppCookie);
};

```

IEnumDebugApplicationNodes

Enumerates Application nodes. Generally used to enumerate child nodes of a node associated with an application. Example: a project window.

```

[
object,
uuid(51973C3a-CB0C-11d0-B5C9-00A0244A0E7A),
helpstring("IEnumDebugApplicationNodes Interface"),
pointer_default(unique)
]
interface IEnumDebugApplicationNodes : IUnknown {
[local]
HRESULT __stdcall Next(
[in] ULONG celt,
[out] IDebugApplicationNode **pprddp,
[out] ULONG *pceltFetched);

HRESULT Skip(
[in] ULONG celt);

HRESULT Reset(void);

HRESULT Clone(
[out] IEnumDebugApplicationNodes **pprddp);
};

```


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IEnumRemoteDebugApplications

Used to enumerate the running applications on a machine.

```
[
  object,
  uuid(51973C3b-CB0C-11d0-B5C9-00A0244A0E7A),
  helpstring("IEnumRemoteDebugApplications Interface"),
  pointer_default(unique)
]
interface IEnumRemoteDebugApplications : IUnknown {
[local]
  HRESULT __stdcall Next(
    [in] ULONG celt,
    [out] IRemoteDebugApplication **ppda,
    [out] ULONG *pceltFetched);
  HRESULT Skip(
    [in] ULONG celt);

  HRESULT Reset(void);

  HRESULT Clone(
    [out] IEnumRemoteDebugApplications **ppessd);
}
```

IEnumRemoteDebugApplicationThreads

Used to enumerate the running threads in an application.

```
[
  object,
  uuid(51973C3c-CB0C-11d0-B5C9-00A0244A0E7A),
  helpstring("IEnumRemoteDebugApplicationThreads Interface"),
  pointer_default(unique)
]
interface IEnumRemoteDebugApplicationThreads : IUnknown {
[local]
  HRESULT __stdcall Next(
    [in] ULONG celt,
    [out] IRemoteDebugApplicationThread **pprdat,
    [out] ULONG *pceltFetched);

  HRESULT Skip(
    [in] ULONG celt);
}
```

```
HRESULT Reset(void);
```

```
HRESULT Clone(  
[out] IEnumRemoteDebugApplicationThreads **ppperdat;  
)
```

IDebugFormatter

IDebugFormatter allows a language or IDE to customize the conversion between variants or VARTYPES and strings. This interface is used by the ITypeInfo->IDebugProperty mapping implementation.

```
[  
object,  
uuid(51973C3d-CB0C-11d0-B5C9-00A0244A0E7A),  
helpstring("IDebugFormatter Interface"),  
pointer_default(unique),  
local  
]  
interface IDebugFormatter : IUnknown  
{  
    HRESULT GetStringForVariant([in] VARIANT *pvar, [out] BSTR *pbstrValue);  
    HRESULT GetVariantForString([in] LPCOLESTR pwstrValue, [out] VARIANT *pvar);  
    HRESULT GetStringForVarType([in] VARTYPE vt, [in] TYPEDESC *ptdescArrayType,  
    [out] BSTR *pbstr);  
}
```

ISimpleConnectionPoint

This interface is the "IDispatchEx" of event interfaces. It provides a simple way for describing and enumerating the events fired on a particular connection point and also for hooking up an IDispatch to those events. This interface will be available as extended info via the IDebugProperty interface on objects which support events. For simplicity, this interface only works with dispinterfaces.

```
[  
object,  
uuid(51973C3e-CB0C-11d0-B5C9-00A0244A0E7A),  
helpstring("ISimpleConnectionPoint Interface"),  
pointer_default(unique),  
local  
]
```

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```
interface ISimpleConnectionPoint : IUnknown
{
// Return the number of events exposed on this interface
HRESULT GetEventCount([out] ULONG *pulCount);

// Return the DISPID and NAME for "cEvents" events, starting at "iEvent".
// The number of
//- Returns S_OK if all of the requested elements were returned.
//- Returns S_FALSE if the enumeration finished and the
//requested number of elements was not available.
//(Unavailable elements will be returned as DISPID_NULL and a null bstr.)
//- Returns E_INVALIDARG (or other error status) if no elements could be fetched

HRESULT DescribeEvents(
[in] ULONG iEvent, // starting event index
[in] ULONG cEvents, // number of events to fetch info for
[out, size_is(cEvents), length_is(*pcEventsFetched)]
DISPID *prgid, // DISPIDs of the events
[out, size_is(cEvents), length_is(*pcEventsFetched)]
BSTR *prgbstr,
[out] ULONG *pcEventsFetched
); // names of the events

HRESULT Advise([in] IDispatch *pdisp, [out] DWORD* pdwCookie);
HRESULT Unadvise([in] DWORD dwCookie);
};
```

IDebugHelper

Serves as a factory for object browsers and simple connection points.

```
cpp_quote( "EXTERN_C const CLSID CLSID_DebugHelper;" )
[
object,
uuid(51973C3f-CB0C-11d0-B5C9-00A0244A0E7A),
helpstring("IDebugHelper Interface"),
pointer_default(unique),
local
]
interface IDebugHelper : IUnknown
{
// Returns a property browser that wraps a VARIANT
HRESULT CreatePropertyBrowser(
[in] VARIANT *pvar, // root variant to browse
[in] LPCOLESTR bstrName, // name to give the root
```

[in] IdebugApplicationThread *pdat, // thread to request properties on or NULL
[out] IDebugProperty**ppdob);

// Returns a property browser that wraps a VARIANT, and allows for custom conversion
// of variants or VARTYPEs to strings

HRESULT CreatePropertyBrowserEx(

[in] VARIANT *pvar, // root variant to browse

[in] LPCOLESTR bstrName, // name to give the root

[in] IdebugApplicationThread *pdat, // thread to request properties on or NULL

[in] IdebugFormatter *pdf, // provides custom formatting of variants

[out] IDebugProperty**ppdob);

// Returns an event interface that wraps the given IDispatch (see ISimpleConnectionPoint)

HRESULT CreateSimpleConnectionPoint(

[in] IDispatch *pdisp,

[out] ISimpleConnectionPoint **ppscp);

};

IEnumDebugExpressionContexts

[
object,
uuid(51973C40-CB0C-11d0-B5C9-00A0244A0E7A),
helpstring("IEnumDebugExpressionContexts Interface"),
pointer_default(unique)
]

interface IEnumDebugExpressionContexts : IUnknown

{

[local]

HRESULT __stdcall Next(

[in] ULONG celt,

[out] IdebugExpressionContext **ppdec,

[out] ULONG *pceltFetched);

HRESULT Skip(

[in] ULONG celt);

HRESULT Reset(void);

HRESULT Clone(

[out] IEnumDebugExpressionContexts **ppedec);

}

IProvideExpressionContexts

Provides a means for enumerating expression contexts known by a certain component. Generally implemented by each script engine. Used by the process debug manager to find all global expression contexts associated with a given thread. Note: This interface is called from within the thread of interest. It is up to the implementor to identify the current thread and return an appropriate enumerator.

```
[
  object,
  uuid(51973C41-CB0C-11d0-B5C9-00A0244A0E7A),
  pointer_default(unique)
]
interface IProvideExpressionContexts : IUnknown
{
  // Returns an enumerator of expression contexts.
  HRESULT EnumExpressionContexts(
    [out] IenumDebugExpressionContexts **ppedec);
}

[
  uuid(78a51821-51f4-11d0-8f20-00805f2cd064),
  version(1.0),
  helpstring("ProcessDebugManagerLib 1.0 Type Library")
]
library ProcessDebugManagerLib
{
  importlib("stdole2.tlb");

  interface IActiveScriptDebug;
  interface IActiveScriptErrorDebug;
  interface IActiveScriptSiteDebug;
  interface IApplicationDebugger;
  interface IApplicationDebuggerUI;
  interface IDebugApplication;
  interface IDebugApplicationNode;
  interface IDebugApplicationNodeEvents;
  interface IDebugApplicationThread;
  interface IDebugAsyncOperation;
  interface IDebugAsyncOperationCallBack;
  interface IDebugCodeContext;
  interface IDebugCookie;
  interface IDebugDocument;
  interface IDebugDocumentContext;
  interface IDebugDocumentHelper;
  interface IDebugDocumentHost;
  interface IDebugDocumentInfo;
  interface IDebugDocumentProvider;
```

```

interface IDebugDocumentText;
interface IDebugDocumentTextAuthor;
interface IDebugDocumentTextEvents;
interface IDebugDocumentTextExternalAuthor;
interface IDebugExpression;
interface IDebugExpressionCallBack;
interface IDebugExpressionContext;
interface IDebugFormatter;
interface IDebugHelper;
interface IDebugSessionProvider;
interface IDebugStackFrame;
interface IDebugStackFrameSniffer;
interface IDebugStackFrameSnifferEx;
interface IDebugSyncOperation;
interface IDebugThreadCall;
interface IEnumDebugApplicationNodes;
interface IEnumDebugCodeContexts;
interface IEnumDebugExpressionContexts;
interface IEnumDebugStackFrames;
interface IEnumRemoteDebugApplications;
interface IEnumRemoteDebugApplicationThreads;
interface IMachineDebugManager;
interface IMachineDebugManagerCookie;
interface IMachineDebugManagerEvents;
interface IProcessDebugManager;
interface IProvideExpressionContexts;
interface IRemoteDebugApplication;
interface IRemoteDebugApplicationEvents;
interface IRemoteDebugApplicationThread;
interface ISimpleConnectionPoint;

```

```

[
  uuid(78a51822-51f4-11d0-8f20-00805f2cd064),
  helpstring("ProcessDebugManager Class")
]

```

```

coclass ProcessDebugManager
{
  [default] interface IProcessDebugManager;
};

```

```

[
  uuid(0BFCC060-8C1D-11d0-ACCD-00AA0060275C),
  helpstring("DebugHelper Class")
]

```

```

coclass DebugHelper
{

```

```
[default] interface IDebugHelper;
};

// CDebugDocumentHelper
//
// The CDebugDocumentHelper makes it much easier for an ActiveScripting
// host or scripting engine to implement the IDebugDocument interfaces.
//
// Given the source text and (optionally) script blocks for a host's
// document, CDebugDocumentHelper provides implementations for
// the debug document interfaces, including:
//
// IDebugDocumentText
// IDebugDocumentTextAuthor (for authoring)
// IDebugDocumentContext
//
// This class supports aggregation, so the host may provide a controlling
// unknown to CoCreateInstance for extensibility.
//
// This class fires events on IDebugDocumentTextEvents, so the host
// can monitor all changes to the document via that interface.
cpp_quote( "EXTERN_C const CLSID CLSID_CDebugDocumentHelper;" )
[
  uuid(83B8BCA6-687C-11D0-A405-00AA0060275C),
  helpstring("DebugDocumentHelper Class")
]
coclass CDebugDocumentHelper
{
[default] interface IDebugDocumentHelper;
interface IDebugDocumentProvider;
interface IDebugDocument;
interface IDebugDocumentText;
interface IDebugDocumentTextAuthor;
interface IConnectionPointContainer;
[default, source] interface IDebugDocumentTextEvents;
};
};
```